Quality Assurance Project Plan

Wilcox Oil Cleanup Strategy

SSID: 06GG RA01

USEPA REGION 6 ERRS CONTRACT

CONTRACT NO. EPS41604

December 4, 2020

Prepared by:
Environmental Restoration LLC
1666 Fabick Drive
St. Louis, Missouri 63026

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LIST OF ACRONYMS

°C	degrees Celsius
ASQ	American Society for Quality
ASTM	American Society of Testing & Materials
CA	Corrective Action
CCC	Calibration Check Compound
CCV	continuing calibration verification
CF	Calibration Factor
CHMM	Certified Hazardous Materials Manager
CLP	Contract Laboratory Program
CO	Contracting Officer
COC	Chain of Custody
COR	Contracting Officer Representative
CRQL	Contract Required Quantitation Limits
CVAA	Cold Vapor Atomic Absorption
DQA	Data Quality Assessment
DQI	Data Quality Indicator
DQO	Data Quality Objective
DOT	Department of Transportation
EDD	electronic data deliverable
EPA	United States Environmental Protection Agency
ER	Environmental Restoration LLC
ERRS	Emergency and Rapid Response Services Contract
ERT	Environmental Response Team
FCA	Field Cost Accountant
FSP	Field Sampling Plan
GC	gas chromatography
GC/MS	gas chromatography / mass spectrometry
GPS	Global Positioning System
HASP	Health and Safety Plan
HDPE	High Density Polyethylene
ICAL	Initial calibration
ICP-AES	inductively coupled plasma atomic emission spectroscopy
ICP -MS	Inductively coupled plasma atomic mass spectroscopy
ICS	Incident Command System
IDW	investigation-derived waste
ISTD	Instrument Standard
LCS	laboratory control sample
LIMS	Laboratory Information Management System
LOD	limit of detection
LOQ	limit of quantitation
MDL	method detection limit
mg/kg	milligrams per kilogram
mg/L	Milligram per Liter
MPC	Measurement Performance Criteria
MS/MSD	matrix spike/ matrix spike duplicate
NA	not applicable
NELAP	National Environmental Laboratory Accreditation Program
NFG	National Functional Guidelines
NIOSH	National Institute of Safety & Health
OSC	On-Scene Coordinator (EPA)
PAL	Project Action Limit
PCB	Polychlorinated biphenyls
PM	Program Manager
PO	Project Officer (EPA)
POC	Point of Contact
PPE	Personal Protective Equipment
ppm	parts per million
PQM	Program Quality Assurance Manager
PSO	Program Safety Officer
QA	quality assurance
QAM	Quality Assurance Manager
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	quality control
QMP	Quality Management Plan
RL	reporting limit
RM	Response Manager
RPD	relative percent difference
RSD	relative standard deviation
SAP	Sampling and Analysis Plan
SSID	Superfund Site Identification Number
SSO	Site Safety Officer
SVOC	Semi-volatile Organic Compounds
SW846	EPA Method SW 846.
T&D	Transportation and Disposal
TAL	Target Analyte List
TAT	Turn-around Time
TBD	to be determined
TCLP	Toxic Characteristic Leaching Procedure
TSA	Technical Systems Audit
UFP	Uniform Federal Policy
VOC	Volatile Organic Compounds

INTRODUCTION

Under the Environmental Protection Agency (EPA) Emergency and Rapid Response Services (ERRS) Contract, Environmental Restoration, LLC (ER) is required to provide cleanup personnel, equipment, and materials. ER will conduct activities as directed by the EPA Contracting Officer Representative (COR) or On-Scene Coordinator (OSC). Data generated by ER will be provided to the EPA COR.

The ER quality program uses a graded approach, using documents prepared by ER, as described in the following table.

Quality Management System		
Plan	**Hierarchy**	**Description**
Quality Management Plan (Region 6 ERRS QMP)	Applicable to all Region 6 ERRS projects	• Describes the general practices of the Region 6 ERRS program • Documents how ER will plan, implement, and assess the effectiveness of its quality assurance/ quality control (QA/QC) operations under the EPA Region 6 contract • Describes the ER quality system structure, including the quality policies and procedures; areas of application; and roles, responsibilities, and authorities
Project Quality Assurance Project Plan (QAPP)	Applicable to specific projects	• Details environmental data quality requirements based on site specific needs including any deviations from the QMP. Uses Optimized UFP-QAPP Worksheets meeting EPA QA/R-5 • Includes site background information, goals, and specific tasks • Includes details on project specific sampling activities and analyses
The site **HASP** provides additional information.		

EPA has directed ER to develop this QAPP and FSP to reflect the specific objectives of data acquired during cleanup strategy construction and supporting work. Work will be completed in accordance with the Wilcox Oil SOW, the final Source Control Record of Decision (2018) (Attachment 3), the specifications developed in the Source Control Remedial Design (RD) (Attachment 4), and information gathered during the site visit. Specifically, this QAPP will cover sampling, monitoring, and analyses for characterization of site wastes, field screening during construction to guide activities, sampling of material brought on site to ensure material is appropriate for use, and sampling to confirm cleanup strategy is complete.

This project specific QAPP, provides specific details according to site goals and activities. When prepared in accordance with the Uniform Federal Policy (UFP)-QAPP and addressing each optimized worksheet, this document will address required content of a SAP as described in the National Contingency Plan. A SAP describes the number, type, and location of samples, the type of analyses, and policies, organization, functional activities, and the data quality objectives (DQOs) and measures necessary to achieve adequate data quality.

This project specific QAPP is supported by a project specific HASP and ERRS Task Order (TO) which include quality assurance/ quality control (QA/QC) details and/or procedures pertinent to specific project requirements.

WORKSHEET 1 & 2 | TITLE & APPROVAL PAGE

Document Title:	Project Specific Quality Assurance Project Plan for Wilcox Oil Cleanup Strategy
Site Name	Wilcox Oil Cleanup Strategy
Site City, County, State	Bristow, OK
SSID	06GG RA01
Task Order (TO)	68HE0620F0018
Job Code	WO6-18
Lead Organization	Unites States Environmental Protection Agency (EPA)
Contract	EPA Region 6 ERRS Contract
Prime Contractor	Environmental Restoration LLC (ER)
Contract Number	EP-S4-16-4
QAPP Date	December 4, 2020
QAPP Revision	Draft
QAPP Type	Project Specific
Guidance used to Prepare QAPP	Uniform Federal Policy for Quality Assurance Project Plans Manual March 2005; Optimized UFP-QAPP Worksheets, March 2012 EPA QA/R-5, EPA Requirements for Quality Assurance Project Plans (March 2001, Reissue May 2006)
Regulatory Program	Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) emergency response, time-critical Removals, and rapid remedial actions
Previous Relevant Reports	

Approval for Implementation:

1. **Signature**: _____
   Mike Gipson, ER Response Manager Date

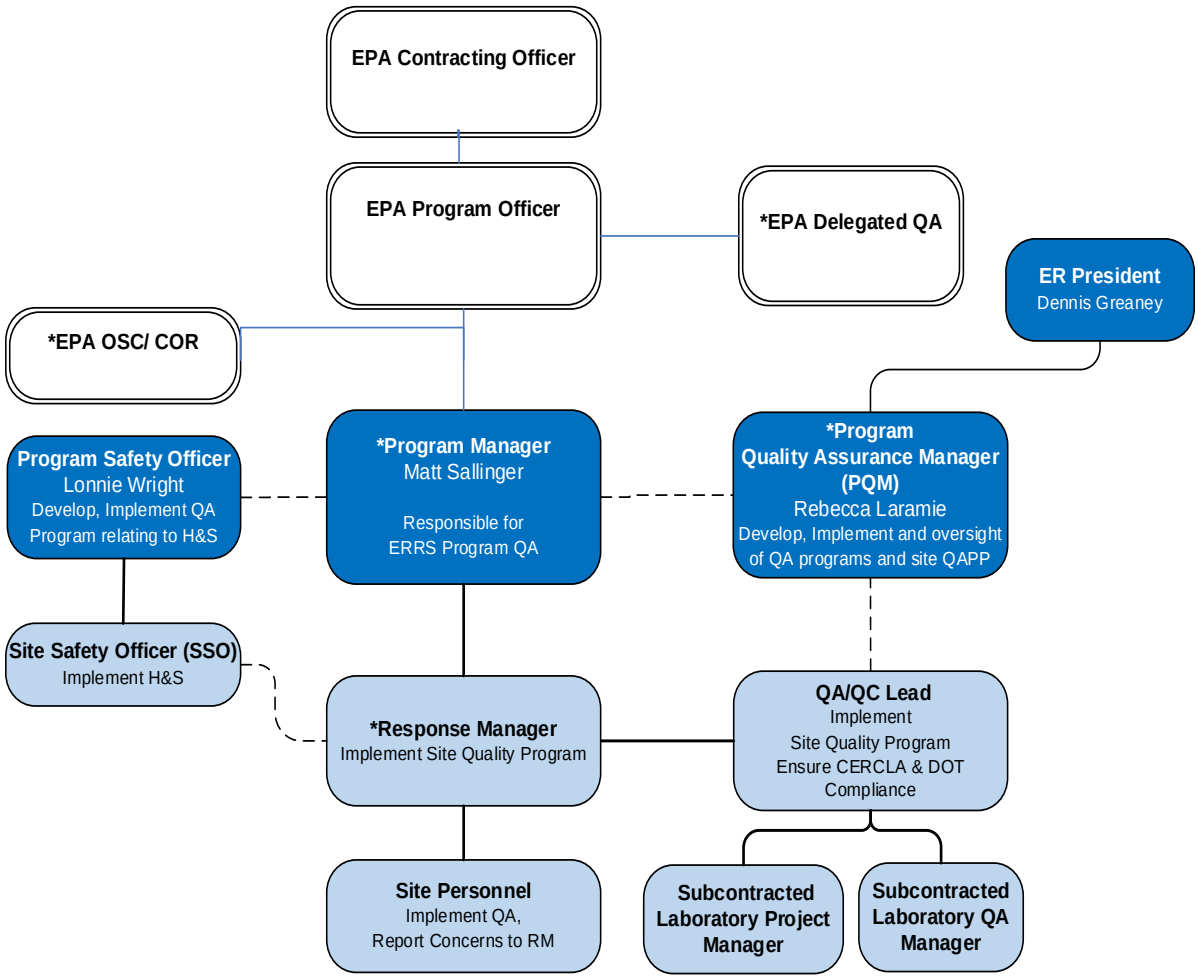
2. **Signature**: _____
   Rebecca Laramie, ER Program Quality Assurance Manager Date

3. **Signature**: _____
   Katrina Higgins-Coltrain EPA Contracting Officer Representative Date

4. **Signature**: _____
   EPA Quality Officer/ Designee Date

WORKSHEET 3 & 5 | PROJECT ORGANIZATION AND QAPP DISTRIBUTION

- UFP-QAPP Manual Section 2.3 and 2.4



*QAPP Recipient

The most current and approved copy of the QAPP will be located on the ER intranet. Response Manager will be provided an extra copy for the "field copy"

Personnel roles and responsibilities during site activities are listed in **Worksheet 6** and in the Region 6 QMP.

WORKSHEET 4, 7 & 8 | PERSONNEL QUALIFICATIONS AND SIGN-OFF SHEET

❖ UFP-QAPP Manual Sections 2.3.2 - 2.3.4

Name	Position/ Contact	Education / Experience[1]	Signature[2]
Matthew Salinger	Program Manager m.salinger@erllc.com	B.S. Marine Biology, 28 yrs ERRS technical exp.	
Rebecca Laramie	Program QA Manager r.laramie@erllc.com	MBA, B.S. Environmental Eng. Minor chemistry. 22 yrs in enve industry,12 years high-level quality management experience. PMP	
Lonnie Wright	Program Safety Officer l.wright@erllc.com	CSP, CHMM, B.S. Industrial Safety, 30 years' experience in the enve remediation industry	Not Required
Mike Gipson	Response Manager m.gipson@erllc.com	17 years ERRS technical experience, approved ERRS RM since 2014	
TBD	T&D Coordinator @erllc.com	TBD	
TBD	QA/QC Lead	TBD	
TBD	Site Safety Officer (SSO)	TBD	
TBD	Sampler (additional)	TBD	
TBD	Subcontractor Lab(s)	TBD	

[1]Personnel assigned to project positions will meet contract required specifications listed in the QMP, Attachment 1
[2]Personnel with sampling, analytical, or quality related site tasks will sign this table after review prior to work.
See **Worksheet 6** and the Region 6 ERRS QMP for personnel roles and responsibilities during site activities.

Training:

As described in the Region 6 ERRS QMP, a graded approach is used to provide personnel with the appropriate amount of quality training based on their job function and tasks. Specifically, the Program Manger (PM) and project management personnel having responsibilities of developing and implementing project specific quality documents are provided training on how to complete a quality document according to EPA, including the type of data required and where to find the information. This is added to general training on document control, quality and sampling related standard operating procedures (SOPs), general discussion on procedures and processes, and roles and responsibilities necessary to implement the QMP. Response Managers (RMs) and field staff collecting environmental data receive training on sampling strategy, collecting samples, appropriate QC, and sample handling and chain of custody. The following table lists the training and frequency by personnel for this site. See QMP for training certification storage.

Training: Title or Description of Course	Frequency	Personnel Receiving Training
Health and Safety Training/ Field Training/ ER Project Management Training / ICS Training		
See QMP Section 5.0 for list of training for ERRS personnel by job type.		
Specialized Training		
Radiation Safety for XRF Training/ XRF Operation[1]	Once	XRF Operator
[1] field test competency will be determined based on past training and past on-site experience https://www.thermofisher.com/us/en/home/industrial/spectroscopy-elemental-isotope-analysis/portable-analysis-material-id/xrf-radiation-safety-training.html		

WORKSHEET 6 | COMMUNICATION PATHWAYS

- UFP-QAPP Manual Section 2.4.2

Communication Drivers	Organization/ Position*	Procedures (Timing, Pathways, Documentation)
Approves contract and project specific QA documents	EPA Delegated QA Authority	Approves documents in accordance with EPA requirement/guidance documents and policy. Approves project specific QAPPs. Provides guidance for site-specific QA.
Regulatory/Project direction	EPA COR	Provides on-site technical direction in accordance with the National Contingency Plan and ERRS contract to ensure overall site objectives are met.
Commit/Assign Resources POC with EPA CO	ER PM	Ensure that trained, qualified personnel and adequate resources are provided to perform the cleanup activity. Maintain lines of communication between EPA CO, COR, and RM.
Manage Project Phases	ER RM	Manage day to day operations of the project. Reports to PM and EPA OSC/COR issues with cost, schedule, etc. Ensure QA project requirements are met. Maintain field documentation/ records. Point of Contact (POC) for COR.
Field Progress Reports		
Corrective Actions (CAs)		
Health and Safety Compliance/ Monitoring/ Reporting/ Training	ER Program Safety Officer (PSO)/ SSO	Prepare or review site HASP and ensure proper implementation. Communicates daily with RM and PM on safety issues/reporting. Directs upgrade/downgrade of PPE. Establish/ ensure work zones are delineated and maintained. Maintain H&S records. Conduct audits.
Health and Safety Concerns	All personnel	Communicate health and safety concerns.
Disposal	T&D Coordinator/ RM	Ensure transporters are compliant with DOT regulations and Resource Conservation and Recovery Act (RCRA) can take CERCLA waste for projects requiring offsite T&D. Communicate status to RM.
QAPP Changes Prior to Field Work, Field & Analytical CAs	ER PQM/ ER RM	The PQM keeps official QAPP, communicates QAPP changes to the RM and EPA COR/CO. Communicates with field team to determine need for field and analytical Corrective Actions (CAs).
QAPP Changes in the Field	RM, QA/QC Lead, T&D Coordinator	Prepare/ implement the project specific QAPP. Communicate QAPP changes and field sampling activities to EPA COR and RM when required. Set up lab. Communicate changes to the lab. The PQM and PM approve major changes to the QAPP.
Data Tracking and Management, Release of Analytical Data	QA/QC Lead, T&D Coordinator	CAs determined on review of data. No analytical data will be released prior to review/validation as described in this document. Releases approved by reviewer and COR.
Lab Data Quality Issues/ CAs	Laboratory Project Manager	Will report project sample issues to the QA/QC lead or T&D Coordinator within 2 business days.
Data Validation	Validator	Validator will report validation issues or missing data to QA/QC Lead within 2 business days.
Verification/ Data Review Issues	QA/QC Lead,	Report Data Quality Issues to PM/RM. Ensures CAs.
See Worksheet 4,7, & 8 for name and contact information of personnel filling positions		

WORKSHEET 9 | PROJECT PLANNING SESSION SUMMARY

- ❖ UFP-QAPP Manual Section 2.5.1 and Figures 9-12

This worksheet will be completed during the project planning session.

Date of Planning Session: October 29, 2020 **Location: Wilcox Oil Site** **Purpose: Site Walk**				
Name	**Title/Role**	**Organization**	**Phone No.**	**E-mail Address**
Todd Downham	Project Manager	ODEQ		
Katrina Higgins-Coltrain	RPM/COR	EPA		
Mike Gipson	RM	ER		
Matthew Salinger	PM	ER		

Notes: Conducted site walk to gain better understanding of site conditions and determine cleanup strategy including resources. Note EPA was present electronically. Other persons were on-site.

Consensus Decisions Made:

Action Items	**Responsible Party**	**Due Date**

WORKSHEET 10 | CONCEPTUAL SITE MODEL

- UFP-QAPP Manual Section 2.5.2

Background:

Wilcox Oil Company is a 140-150 acre site that operated from the 1920s until 1963 and went through several expansions and mergers in that time. The site includes remnants of former oil refining operations and tank farms and can be divided into five major operational areas: Wilcox Process Area, Lorraine Process Area, East Tank Farm, North Tank Farm (NTF), and Loading Dock Area. An active railroad divides the two former process areas and product storage areas. A vacant church property and several residences are presently located within the boundaries of the site.

Previous investigations have identified the presence of petroleum contamination at eight former aboveground storage tank locations and one sludge separation pit. The tanks and pits were bottomless and unlined, resulting in residual petroleum byproducts remaining following their demolition and removal from the Site. Oily, tar-like liquid is present at the surface or below a thin layer of soil, which migrates to the surface and spreads out when heated by the summer sun. The liquid and solid forms of the contamination are collectively referred to as tank waste source material, which is not classified as hazardous waste based on previous sampling results.

The lead additive area of the Wilcox Process Area is in the southwestern portion of the Site, adjacent to Sand Creek. The source material is located near the surface and contains high concentrations of lead. The areas with highest concentrations are devoid of vegetation and the surface appears bright white, in contrast to darker soils and thick vegetation throughout the rest of the site. The Pit 1 lead excavation area is in the central portion of the East Tank Farm area. The source material is located near surface. Laboratory analysis of the samples in this area indicated the presence of actionable levels of lead reported in the subsurface soil at 6-inch (906 mg/kg) and 12-inch (5850 mg/kg) depths.

The lead additive area contains characteristically hazardous waste based on Toxicity Characteristic Leaching Procedure (TCLP) testing results, which indicate that lead leaches from the source material above Land Disposal Restriction criteria (40 CFR 268.34). Source material from the lead additive area will be treated through stabilization, which in this case, involves the addition and mixing of a reagent with the lead additive area source material at the site, prior to or immediately after excavation and before final loading and transport.

Sources: Additional information and details related to the source areas can be found in the supporting documents: Source Control Record of Decision (2018) and the Final Remedial Design Report for Source Control (2019).

Contaminant(s):

Contaminants of Concern/Concentration Range (if known): Lead and benzo(a)pyrene are selected as the COCs. Lead is present through the lead additive area and exceeds the soil health-based target level. Benzo(a)pyrene is a polycyclic aromatic hydrocarbon (PAH) present in the tank waste and is carcinogenic to humans based on strong and consistent evidence in animals and humans. Benzo(a)pyrene is selected as the representative contaminant for the PAH group because of its low soil health-based target level, it is most commonly detected in the tank waste, and it is co-located with the other PAHs. (ROD 2018)

Source Information:

Facility Type: Historic oil refining and tank farm
Waste Location: Waste is located in the soil. Tanks and refining facilities have been removed during previous actions.

Release Mechanisms:

Primary Release: Initial release was from the tanks and refining facility into the soil

Secondary Migration/ Exposure Medium/ Transport Mechanism: Precipitation may leach contaminants in the soil horizontally or vertically into the groundwater. Soil contaminants may also migrate through surface water runoff.

Site Physical Aspects

Land Use Geography/ Topography: Residential and commercial properties are located adjacent to the site. Due to the size of the site, topography and geography will vary across the site. There are seven residences located on former crude oil storage tank or refinery operations areas. In 2016, two occupied residences located on the East Tank Farm were known to use water from domestic/private wells located onsite; the occupied residence in the North Tank Farm has a private well; however, the residence uses city water. The site is flanked by Route 66 to the west; a residential area and Turner Turnpike to the northwest and north; Sand Creek to the southwest; and residential, agricultural, and wooded areas to the east and south. The topography in the vicinity of the site slopes to the south. The drainage pattern of the property is primarily towards Sand Creek, which borders the western and southwestern boundaries of the property. An intermittent stream (West Tributary), a perennial stream (East Tributary), and several drainage channels transect the property east of the railroad (Wilcox Process Area and East Tank Farm), all which flow into Sand Creek. See Figure in Appendix A for site layout, location of nearby community, and nearest waterway.

Data Gaps:

Exact extent of contaminants are unknown. The following table provides estimates of the aerial and depth extent of contamination. Samples will be collected prior to and during field activities to delineate waste and identify/confirm RCRA waste requiring treatment.

Source Location	Aerial Extent (Square Feet)	Average Depth of Excavation (Feet)	Estimated Volume of Removal (Cubic Yard)
NTF 1	2,875	2	213
Tank 11	12,994	5	2,406
Tank 12	43,363	6	9,636
Pit 1 Tank Waste Area	17,316	3	1,924
Pit 1 Lead Area	8,770	1	327
Lorraine Tank	5,167	2	383
Tank 1	12,472	3	1,386
Tank 3	12,191	8	3,612
Tank 10	48,491	3	5,388
Lead Additive Area 2		2	5,711
Total			30, 986 CY

WORKSHEET 11 | PROJECT/DATA QUALITY OBJECTIVES

❖ UFP-QAPP Manual Section 2.6.1

STEP 1: State the Problem

Primary Decision Maker & Planning Team: The primary decision maker is the COR or designee. The planning team will typically consist of the COR, the ER RM, QA/QC Lead and T&D Coordinator. Due to the dynamic nature of the response, planning will be on-going and additional personnel may be included/ separated to specific tasks. Activities will be evaluated at minimum daily. Previous status reports will be used to prioritize new tasks identified.

Problem Statements: The Task Order (TO)/ Scope of Work (SOW) describes problems as they are currently understood, summarize existing information, and identify concerns/uncertainties to be resolved. The three goals for the site are:

RAO-1: Prevent ingestion and dermal contact exposure to human and ecological receptors removal of tank waste to reach a target health-based concentration of 0.11 mg/kg benzo(a)pyrene and the removal of the lead additive area to reach a target health-based concentration of 800 mg/kg lead.

RAO-2: Prevent contaminant migration to soil, sediment, and indoor air removal of tank waste to reach a target health-based concentration of 0.11 mg/kg benzo(a)pyrene and the removal of the lead additive area to reach a target health-based concentration of 800 mg/kg lead.

RAO-3: Removal of source materials to eliminate and prevent further degradation of the surrounding environment because of exposure to or migration from tank waste and the lead additive area.

Initial information is incomplete, due to complexity and time-critical nature of the project. Therefore, the problem definition is an ongoing process until sufficient information is secured to concisely define the problems. ER field activities to meet the goals include stopping migration of contaminants and characterizing, accumulating, segregating, treating, and disposing of source material in a safe manner, to protect people and the environment from contamination, and to minimize removal costs.

Characterization and confirmation samples during excavations, samples to verify treatment of soil, soil sampling of potential backfill, and perimeter air monitoring will be conducted during site activities to provide additional information.

STEPS 2, 3, and 5: Summary of ER Goals, Data Inputs and Decision Rules

Goal	Input	Decision Rule and Data Quality
Removal of source material	Historical data of source material location, XRF data to guide removal, lab results to confirm removal	• Historical data collected by EPA and EPA contractors are used to identify the source material. • ER is tasked with excavating contaminated source material associated with the NTF 1, Tank 11, Tank 12, Pit 1 Tank Waste Area, Pit 1 Lead Area, Lorraine Tank, Tank 1, Tank 3, Tank 10, Lead Additive Area 2 (See Figure in Appendix A) • XRF field screening will be used to guide excavation during site activities (primarily lead additive area and pit lead source area) • Confirmation samples with 2-3 day TAT will be analyzed by a subcontract laboratory using SW-846 methods to verify excavation is complete (lead < 800 mg/kg; benzo(a)pyrene < 110 ug/kg). Definitive data will be reviewed to ensure that results meet criteria described in this QAPP • Surveys will be completed prior to and after excavation to track volumes of material removed
Treatment of source material	Historical data identifying RCRA material	• After stabilization of the lead additive and pit lead source material that fails the TCLP lead standard, TCLP samples and benzo(a)pyrene samples will be analyzed by a subcontract lab to confirm that material does not contain concentrations of metals above RCRA standards

Air monitoring	Visual and air monitoring to ensure protection	• ER will use air monitoring equipment to establish a safety perimeter based on the presence of potential vapors and/or dust to ensure health and safety of onsite workers, the surrounding community, and the environment.
Stormwater monitoring	Visual inspections and potential lab analysis of samples	• ER will conduct visual inspections of Stormwater BMPs according to ensure drainage control for construction stormwater • Samples may be collected prior to discharge by ER and analyzed by a subcontract lab to ensure OPDES permit and approved SWPPP compliance
Waste Profile: Identify & classify waste stream(s)	Laboratory results	• Lab parameters based on historical data to profile waste stream(s) • Definitive quantitative SW846 results and QC are reviewed to determine potential bias due to matrix or other interferences • Results compared to RCRA to determine verify non-hazardous and meet Treatment, Storage, and Disposal Facility (TSDF) requirements • TSDF will use data for waste profile and appropriate disposal
Restore site	Laboratory results	• Samples will be collected from clean fill material to ensure that material meets site requirements. • Definitive lab results will be compared to EPA RSLs, ASTM standards, and fertility requirements.

See also **Worksheet 15, Worksheets 17, Worksheet 18, and Worksheet 19&30**.

STEP 4: Define Study/Site Boundaries

Source locations (See Figure in Appendix A) will be used as general boundaries for field activities. The site property boundary will be used as the boundary where treatment, air monitoring and stormwater monitoring will be completed.

STEP 6: Specify Tolerable Limits on Decision Error

All sampling and analytical activities incorporate errors, which are beyond the control of the personnel performing the sampling or analytical activities. These errors can mislead a decision- maker; so it is important to determine the impact of these errors. Due to the time-critical nature of projects, error tolerance and data uncertainty is typically not quantified. ERRS will use SOPs to minimize sampling error and provide consistency between results.

XRF field test results are considered screening level data with differing levels of error based on the process used to collect and prepare the samples. In-situ XRF readings have the most error due to potential soil moisture and inhomogeneous material. Samples collected in a baggie provides readings with less error because the sample can be mixed and multiple reading can be collected easily. The most accurate readings are obtained by following the preparation procedure in Method 6200M including drying and sieving, but will not be completed unless there is concern about site conditions (very wet soil) or the values received from the XRF using one of the other two methods (in-situ or using baggies). Multiple field tests at the same location will be completed as described in **Worksheet 20** to measure consistency on sampling/ testing procedures. Re-testing will be completed if the test result is unclear or near the RCRA limits (based on the test method). Laboratory tests will be used for correlation and for definitive data. Results will also be used to evaluate the field-testing process.

STEP 7: Optimize the Design

ER will begin cleanup activities by addressing the tasks with the highest priorities identified during site reconnaissance. This will include removal operations in the lead additive area and the pit area. ER will address several source locations, as possible, concurrently in different phases of removal and restoration. This will allow the removal operations best use of equipment without sacrificing production. Roadway aggregate from areas completed will be removed and used to build roadways to access other source locations. This will reduce the amount of aggregate consumed without affecting overall production. ER will size the equipment used to remove and transport the waste based on the size and location of the source location so that equipment will not be too large or small for that location.

Regulation	Source of Action Levels
RCRA	Characteristic of Hazardous waste 40 CFR 261.21-23 (ignitability, corrosivity, reactivity)
	Toxicity Characteristic Leachate Procedure (TCLP) Limits specified in 40 CFR 261 Subpart C
LDR	40 CFR 268 Subpart C, 268.34. Land Disposal Restriction of Lead Additive Area
ARARs	See Source control ROD for list of ARARs

WORKSHEET 12 | MEASUREMENT PERFORMANCE CRITERIA TABLES

❖ UFP-QAPP Manual Section 2.6.2

Data Quality Indicators (DQIs) are study objectives generated by the seven-step Data Quality Objectives (DQO) process. DQIs are qualitative and quantitative characteristics used to interpret the degree of acceptability of data. The six principle DQIs are precision, accuracy/bias, representativeness, comparability, completeness, and sensitivity. It should be noted that analytical methods influence acceptable amount of precision and accuracy unless stated in a project specific QAPP. DQI definitions are provided below.

Definitions of Data Quality Indicators and Method Assessment	
Precision	A measure of the reproducibility of measurements under a given set of conditions. Precision will be assessed by analyzing laboratory duplicates (from the same sample container) and will be calculated as relative percent difference (RPD).
	$\%RPD = \frac{(S - D) \times 100}{(S + D)/2}$ S = First sample value (original or MS value); D = Second sample value (duplicate or MSD value)
	Example: LCS/LCSD, laboratory duplicate, MS/MSD, field duplicates, and collocated samples.
Accuracy/ Bias	A measure of the bias that exists in a measurement system. Matrix spike samples performed at the laboratory will be used to assess accuracy, which will be expressed in terms of percent recovery. Worksheet 28
	% Recovery = ([Spiked Sample Conc.] – [Unspiked Sample Conc.])/ [Spike Added} x 100%
	Accuracy = (Measure Value/ True Value) x 100%
	Example QC: initial calibration/continuing calibration verification (ICAL/CCV), matrix spikes, laboratory control samples (LCSs), and trip or equipment blanks Worksheet 28
Representative	Degree to which sampling data accurately and precisely represent selected characteristics. Field replicate samples will be used to assess representativeness, expressed in terms of RPD.
Completeness	Measure of the amount of valid data obtained from the measurement system compared to amount expected under ideal conditions. Completeness is calculated as the valid data percentage of the total tests performed.
	$\text{Completeness (\%)} = \frac{\text{Number of valid data results}}{\text{Number of results expected}} \times 100$
Comparability	Measure that expresses the confidence that one data set can be compared with another. Maximized by using standard procedures for field and laboratory operations (sample collection, analytical method, etc.)
Sensitivity	Ability of an analytical method to detect contaminant of concerns and other target compounds at the level of interest. Analytical methods are selected that can meet project-specific levels of detection for contaminants of concern.
	Examples: Instrument Detection Limit (IDL), Method Detection Limit (MDL), Practical Quantitation Limit (PQL), Reporting Limit (RL), Contract Required Detection Limit (CRDL), and/or Contract Required Quantitation Limit (CRQL)

Non-sampling data will be generated for many of the ER tasks including construction, containment, and restoration activities. Inspections will be used to verify work is completed in accordance with site requirements and to prepare punch lists to ensure completion of outstanding items or activities. Completeness will be used to measure performance. For instance, checklists and daily work reports will be maintained at the discretion of EPA and used to track completeness. The EPA COR will verify that the activity is complete. Because of the limited quality indicators

that can be applied to non-sampling data, data reviews for accuracy (verify no data entry errors) and completeness are typically completed. The following table provides general site measurement performance criteria. The QA/QC Lead and T&D Coordinator will review field test results and analytical data, including QC data, to determine if additional waste profile samples are needed to fill data gaps. The RM, PQM, and Treatment, Storage, and Disposal Facility (TSDF) may assist the T&D coordinator in determining completeness.

Measurement Performance Criteria Table				
Analytical Method/ Matrix/ Concentration	**Data Quality Indicators (DQIs)**	**QC Sample and/or Measurement Performance Activity**	**Measurement Performance Criteria (MPC)**	**Assesses Error Sampling (S) Analytical (A)**
General Chemical Sampling	Completeness	≥ 90%	Data will be evaluated to determine if sufficient data/quality. More samples may be collected to fill data gaps.	S & A
	Comparable	Collaborative Data, Duplicates	Includes a review of other MPC XRF/ duplicates and lab results are comparable	S & A
	Representative	Qualitative	Includes a review of other MPC	S & A
	Sensitivity	MDL/ RL (CRQL) verification	Method Specific (See **Worksheet 15**)	A
	Accuracy/ Bias	Temperature Blank	4°C ± 2°C (Analyses that are temperature sensitive)	S
	Accuracy/ Bias	Trip Blank	Analyte Result < RL (VOCs only)	S
	Precision	Field Duplicate	% RPD < 20 (water) %RPD < 35 (Soil)	S & A
	Precision	XRF baggies (3 measurements)	10% of the mean of the three measurements	S&A
	Accuracy/ Bias	Equipment Blank	Analyte Result < RL (Sampling equipment requiring Decon)	S
Method Specific	See **Worksheet 28** for QC to determine analytical error and respective criteria			A

°C degrees Celsius
CRQL Contract Required Quantitation Limit
MDL Method detection limit
RL Reporting Limit
VOC Volatile Organic Compounds

WORKSHEET 13| SECONDARY DATA USES AND LIMITATIONS

❖UFP-QAPP Manual Section 2.7

Data Type	Data Source (originating organization, report title and date)	Data Uses Relative to Current Project	Factors Affecting Data Reliability and Use Limitations
Safety Data Sheet (SDS)	Manufacturer/supplier or Online SDS site	Defines chemical parameters and Safety risk of materials	Source, age of document. Similar SDS may be compared for similarities
Historical and Current Site Use and Investigations	Historical Records, Previous Investigations, Visual Site Reconnaissance, and Interviews	Supplemental background information on historical site use and current site conditions, and previous investigations	Source/Author of Documents, Age of documents

The secondary data evaluation process uses a tiered approach. Data that is not used for decision making by EPA (antidotal information or guidance of data collection) may not be evaluated or may be reviewed for completeness and obvious errors. Most secondary data obtained by ERRS falls under this category. On the occasion that environmental data collected outside the direction of an EPA program is used to make site decisions, a more thorough evaluation will be completed as described in the QMP, Section 4.3.3 and Attachment 4. If a different contractor is tasked to perform the evaluation, ER will not duplicate the activities. Data collected under the direction of an EPA program is already of known quality and does not require a duplicative evaluation by ER.

WORKSHEET 14 & 16 | PROJECT TASKS & SCHEDULE

- UFP-QAPP Manual Section 2.8.2

General project dates, including mobilization will be provided in the TO and in accordance with contract requirements. It is expected that field activities will be accomplished in 13 weeks. Dates may be modified in the daily work order (DWO) due to site conditions and prioritization of work based on new data. The schedule will be modified as appropriate under the direction of the COR during daily site coordination meetings. The RM is responsible for notifying the COR of schedule delays. Site work is complete when objectives as stated in the TO SOW and/or DWO have been met. The COR and other stakeholders will be involved in the following activities. The COR will guide planning activities and will ultimately review and approve document. Site access agreements will be managed by the EPA COR with the assistance of ER as needed. ER will not conduct activities without proper access.

Site Specific Task	Responsible Personnel	Deliverable
Project Planning Develop work plan/cost estimate/site schedule	RM	Work Plan and Schedule. Draft provided prior to work
Develop Sampling Design/Procedures	RM, QA/QC Lead, T&D Coordinator, PSO, SSO	Project Specific QAPP
Select Analytical Parameters		
Develop QAPP and EPA R6 Crosswalk	RM, QA/QC Lead, T&D Coordinator, PQM	
Develop Health and Safety Plan (HASP)	RM, PSO, SSO	HASP prior to field activities. New tasks added as identified
Address EPA Comments	Report Writer, RM	Final Reports
Mobilization/Demobilization	RM	NA
Procurement	FCA, RM	Purchasing Documents
Daily Work Orders (DWO)	RM	DWO provided daily
Daily Cost Summary Reports	FCA, RM	EPA Form 1900-55
Over-site	RM	Logbook
Health & Safety	SSO	HASP/ Logbooks/ Daily toolbox
General Operations (excavation/ inspections)	Site Personnel	Logbook/ field forms
Material Tracking (brought to site)	RM	Tracking Spreadsheet
Perimeter Air Monitoring		
ER Sample Collection	QA/QC Lead, T&D Coordinator, Sample Team	Logbook/ Field Form
Field Measurements & Monitoring		
Field XRF		
Laboratory Analytical Activities	QA/QC Lead, T&D Coordinator	Data Package/ Database
Photo Documentation	RM/ Site Personnel	Photolog
Waste Disposal Tracking	QA/QC Lead, T&D Coordinator	Tracking Spreadsheet
Transportation & Disposal	QA/QC Lead, T&D Coordinator	Manifest/ Shipping Documents
Data Verification, Review, Validation	QA/QC Lead, PQM	Review/ Validation Report
Data Usability Assessment/Reporting	RM, QA/QC Lead, T&D Coordinator	Usability Memo
Assessment/Audits	PQM, RM, PSO, SSO	Report

WORKSHEET 15 | PROJECT ACTION LIMITS AND LABORATORY-SPECIFIC DETECTION/QUANTITATION LIMITS

- ❖ UFP-QAPP Manual Sections 2.6.2.3 and Figure 15

ER activities, including guiding and confirming completion of excavation and treatment and disposal will be driven by sample results compared to the Project Action Limits (PALs) provided in the following table. Site COCs (lead and benzo(a)pyrene use EPA Industrial and Residential Regional Screening Levels (RSLs), respectively. Waste profile samples and treatment confirmation will be guided by RCRA standards and TSCA standards (if PCB analysis is required by the TSDF). Clean material such as backfill and topsoil will use EPA RSLs target cancer risk (TR) of 1E-06 and target hazard quotients (THQ) of 1.0.

Analytical Method and Matrix[1]	Analyte	Project Action Limit (PAL)[2]	Example Lab Reporting Limits	Units
Total Lead	Lead	800	See Appendix E	mg/kg
Total Benzo(a) pyrene	Benzo(a) Pyrene	110	See Appendix E	µg/kg
Waste Profile				
TCLP Volatile Organics	1,1-Dichloroethene	700	10	µg/L
	1,2-Dichloroethane	500	10	µg/L
	2-Butanone	200,000	20	µg/L
	Benzene	500	10	µg/L
	Carbon tetrachloride	500	50	µg/L
	Chlorobenzene	100,000	10	µg/L
	Chloroform	6,000	20	µg/L
	Tetrachloroethene	700	10	µg/L
	Trichloroethene	500	10	µg/L
	Vinyl chloride	200	20	µg/L
TCLP Semi-Volatile Organics	1,4-Dichlorobenzene	7,500	10	µg/L
	2,4,5-Trichlorophenol	400,000	50	µg/L
	2,4,6-Trichlorophenol	2,000	50	µg/L
	2,4-Dinitrotoluene	130	50	µg/L
	Hexachloro-1,3-butadiene	500	50	µg/L
	Hexachlorobenzene	130	50	µg/L
	Hexachloroethane	3,000	50	µg/L
	m-Cresol	200,000	50	µg/L
	Nitrobenzene	2,000	50	µg/L
	o-Cresol	200,000	50	µg/L
	p-Cresol	200,000	50	µg/L
	Pentachlorophenol	100,000	50	µg/L
	Pyridine	5,000	25	µg/L
TCLP Metals	Arsenic	5.0	0.010	mg/L
	Barium	100	0.050	mg/L
	Cadmium	1.0	0.0040	mg/L
	Chromium	5.0	0.010	mg/L
	Lead	5.0	0.010	mg/L

Analytical Method and Matrix[1]	Analyte	Project Action Limit (PAL)[2]	Example Lab Reporting Limits	Units
	Selenium	1.0	0.050	mg/L
	Silver	5.0	0.0050	mg/L
TCLP Mercury	Mercury	0.2	0.00010	mg/L
TCLP Pesticides[4]	Gamma-BHC (Lindane)	400	0.031	µg/L
	Chlordane	30	0.21	µg/L
	Endrin	20	0.083	µg/L
	Heptachlor	8	0.052	µg/L
	Heptachlor epoxide	NA	0.052	µg/L
	Methoxychlor	10,000	0.52	µg/L
	Toxaphene	500	1.0	µg/L
TCLP Herbicides[4]	2,4-D	10	50	mg/L
	2,4,5-TP (Silvex)	1.0	5	mg/L
Total PCBs[4]	Aroclor-1016	50,000 (Total PCBs)	0.20	µg/Kg
	Aroclor-1221		0.20	µg/Kg
	Aroclor-1232		0.20	µg/Kg
	Aroclor-1242		0.20	µg/Kg
	Aroclor-1248		0.20	µg/Kg
	Aroclor-1254		0.20	µg/Kg
	Aroclor-1260		0.20	µg/Kg
	Aroclor-1262		0.20	µg/Kg
	Aroclor-1268		0.20	µg/Kg
Flashpoint Analysis	Flashpoint/Ignitability	flashpoint	<140 °F	°F
Cyanide, Reactive (SW7.3.3.2)[3]	Cyanide, Reactive	-	4.0	mg/Kg
Sulfide, Reactive (SW7.3.4.2)[3]	Sulfide, Reactive	-	20	mg/Kg
Paint Filter	Free Liquid Present	Free Liquid	No Free Liquid	NA
Clean Material				
See Appendix E for EPA Residential RSLs used as standards for Clean Material (Backfill and Topsoil) compared to 2 Example Houston Laboratories				

[1] Samples will be analyzed for listed parameters. See 19 & 30 for Analytical Method
[2] Waste Profile PALs are based on the regulatory limits for the determination of RCRA hazardous waste, except for Total PCBs which is based on the regulatory limits under TSCA in 40 CFR 761.61
[3]There are currently no test methods for reactivity. ER will work with the TSDF, COR, and lab to determine appropriate analyses Possible methods include SW846 SW 7.3.3.2 or 9013A(total) for CN and 7.3.4.2 or 9030B(total) for sulfide.
[4] Waste samples will be analyzed for TCLP herbicides, TCLP pesticides, and PCBs only if the TSDF requires
See Appendix F for Lab QA Manual

WORKSHEET 17 | SAMPLING DESIGN AND RATIONALE

❖ UFP-QAPP Manual Section 3.1.1

Sampling Rationale
Physical Boundaries: *Describe the physical boundaries for the area under study (include maps).*
Appendix A includes a map of the site. The areas of removal (study areas) include NTF 1, Tank 11, Tank 12, Pit 1, Tank Waste Area, Pit 1 Lead Area, Lorraine Tank, Tank 1, Tank 3, Tank 10, and Lead Additive Area 2. Other areas of the site may be used to provide additional work area for staging equipment and treating waste material that fails RCRA.
Time Period: *Describe the time period being represented by the collected data.*
Field test results will represent a point in time during removal activities and will be used to guide further work. Laboratory analytical results will represent COC concentrations remaining after excavation, concentration of analytes in clean material brought on-site, and final waste streams based on the type of sample collected (see Worksheet 18).
Sampling Areas: *Description/ basis for dividing the site into sampling areas (decision units) to support the decision statements in* ***Worksheet 11****.*
• Each source location will be a decision unit initially. • Based on field results and waste profile results, decision units may be combined based on like material to reduce time and cost handling and treating material.
Number of Samples: *Describe the basis for the number and placement of samples within sampling areas.*
• Samples collected for field tests during removal of contaminated soil will be based on visual observations and historical data on the depth of contamination. • Samples collected for laboratory analysis will be based on the volume of waste and the TSDF sample frequency requirements per waste. • Number of samples for confirmation of cleanup will be based on the size of excavation. • Number of samples for stormwater will be based on the frequency and amount of precipitation during field activities. • See Worksheet 18 for estimated number of samples based on the type of sampling.
Sample Locations: *If sample locations will be determined in the field, the decision process for doing so.*
Sample locations will be selected in the field as described in text following this table and **Worksheet 18**.
Sample Limitations and Design Changes: D*ecision process for changing location/ design*
Due to the dynamic nature of the project, sampling activities will be flexible, and may change as site conditions dictate. It is expected that field activities will be guided by historical information and data, assessment field tests, visual cues (observable contamination), and using samples to confirm observations and provide additional detail. If modifications become necessary to the proposed sampling design due to inaccessibility or variability, the RM will discuss revisions with the project COR. Sampling changes will be approved by the EPA COR or designee. Deviations from proposed sampling design will be documented in the project logbook, in the project specific QAPP, or on the QAPP modification form in **Appendix B**

Field Activities:

ER is tasked with excavating source material and soil from the areas listed in the following table and completing proper disposal.

Source Location	Estimated Aerial Extent (Feet^2)	Average Depth of Excavation (Feet)	Estimated Volume of Removal (Cubic Yard)
NTF 1	2,875	2	213
Tank 11	12,994	5	2,406
Tank 12	43,363	6	9,636

Pit 1 Tank Waste Area	17,316	3	1,924
Pit 1 Lead Area	8,770	1	327
Lorraine Tank	5,167	2	383
Tank 1	12,472	3	1,386
Tank 3	12,191	8	3,612
Tank 10	48,491	3	5,388
Lead Additive Area 2		2	5,711
Total			30, 986 CY

ER is also tasked with treating the lead additive area excavated material, prior to disposal, that is characteristically hazardous waste based on Toxicity Characteristic Leaching Procedure (TCLP) testing results for lead.

During excavation and treatment activities, ER apply water for dust control to prevent off-site migration of dust. ER will also use air monitoring equipment to establish a safety perimeter based on the presence of potential vapors and/or dust to ensure the health and safety of onsite workers, the surrounding community, and the environment. Each area with removal or treatment will be evaluated prior to activities to determine if perimeter monitoring for particulates should be conducted to ensure that activities are not causing contaminated material to migrate off-site. During specific excavations, monitors may be placed to ensure safety of persons living on-site. It is expected that at minimum, DataRAMs will be placed at locations upwind and downwind of excavation activities. DataRAMs may also be fitted with a sample cartridge to collect air samples for laboratory analyses. ER will also use a PID monitor near the excavation to monitor the safety of workers. In addition to air monitoring, ER will conduct SWPPP inspections to ensure that contaminants are not migrating off-site. SWPPP inspections will be conducted on a regular basis and after major precipitation events. Stormwater samples may be collected and analyzed before stormwater is discharged preventing discharge of untreated stormwater to streams or wetlands.

Additional samples will be collected and analyzed during field activities as described to guide field activities and to verify when activities are completed.

XRF

The field portable XRF will be used to guide excavation activities by identifying lead concentrations at the base and sides of excavation at any given time. The XRF will be calibrated per manufacturer's recommendation. Calibration checks and standards analysis will be completed at minimum each day prior to use. These steps may also be completed after long timeframes of not using the XRF during the day. Soil samples will be analyzed in the field using X-ray fluorescence (XRF) to provide rapid soil analysis for lead. This will allow for near real-time decision-making and decrease down time or multiple mobilizations to the same location caused by lag time in receiving analytical results.

ER will use in-situ XRF readings or samples collected in a zip-top baggie to obtain sample results for the purpose of decision-making about the need for additional excavation or if the area meets the clean-up levels. Generally, in-situ samples may be collected if lead concentrations are much greater than the project action level (800 mg/kg) or if it is important to have much expedited results. For samples collected in a zip-top baggie, XRF sample locations may consist of grab or composite samples collected to delineate a specific zone. Samples will be collected from the excavated surface with a clean soil sampler. The aliquots shall be thoroughly mixed prior to testing with an XRF. If the soil is too wet, the sample will be dried and sieved through a #10 sieve.

A minimum of 1/20 samples will be measured three times with an XRF. If the three measurements are not within 10% of the mean of the three measurements, the sample will be remixed and measured three times. This cycle will continue until the three measurements are within 10% of their mean. Alternately a duplicate sample may be collected for every 20 samples and compared to MPC values in worksheet 12; however, high levels of lead may interfere with correct readings using the duplicate method. The ER QA/QC lead and/or RM will be responsible for field corrective action.

Once the decision has been made that no additional excavation is required, verification samples shall be obtained. Verification samples will be collected to confirm that clean-up levels have been achieved. Comparison of XRF readings at the base of excavation will be compared to the analytical results of these samples will be used to help determine proper calibration of the XRF instrument. Although, laboratory results will be used to help confirm calibration the "RCRA Standard" Sample or other NIST sample are considered to provide an acceptable measure of value for calibration of the XRF instrument.

Tank Waste Excavation:
After removal of tank waste source material, the excavated area will be surveyed to confirm excavation quantities and sampled to determine contaminant concentrations at the base and sides of excavation. Post-excavation sampling will include grab samples taken from the exposed excavation floor and walls. Excavation floor sample grids of 40 ft by 40 ft will be established, with a 5-point composite taken in each grid. Composite samples include corners and center for each sampling grid. Sidewalls will be sampled every 40 linear feet, with five-point composites taken at the corners and center of the sidewall. If the sidewall material is not homogenous based on field screening methods an aliquot representing each variation can be collected vertically along the side wall to represent the wall sample. Sample analysis will include benzo(a)pyrene and lead.

The excavated areas will be backfilled with clean fill from an offsite source, compacted, and graded to drain by minimizing low spots and flattening any remaining slopes. The area will be covered with organic topsoil and re-vegetated with native plants and grasses via hydroseeding. The ER will be responsible for supplying topsoil for all excavation areas and ensuring 80% vegetation coverage has been achieved. A final survey will be conducted to confirm final backfill quantities.

Lead area Source Material Excavation:
After mixing the stabilizing reagent at the manufacturer's recommended dosage, ER will collect composite samples for TCLP lead analysis at a rate of 1 sample for every 1,000 CY. The time needed for laboratory testing of stabilized material will likely result in multiple, concurrent excavation areas. The effectiveness of the chemical stabilization will be confirmed via sampling directed by the landfill, to include at a minimum, analytical TCLP lead testing. After successful sampling results, the material will be loaded and hauled for disposal at a regulated offsite landfill.

After removal of lead areas source material, the excavated area will be surveyed to confirm excavation quantities and sampled to determine lead concentrations. Post-excavation sampling will be completed by the ER and include grab samples taken of the exposed excavation floor and walls. Excavation floor sample grids of 40 ft by 40 ft will be established, with a 5-point composite taken in each grid. Composite samples include corners and center for each sampling grid. Sidewalls will be sampled every 40 linear feet, with five-point composites taken at the corners and

center of the sidewall. If the sidewall material is not homogenous based on field screening methods an aliquot representing each variation can be collected vertically along the side wall to represent the wall sample. Sample analysis will include Benzo(a)pyrene and lead.

The excavated areas will be graded to drain, minimizing low spots and steep slopes, and using runoff controls where necessary. **Because the final site remedy has not been selected, the import of backfill to the lead source area will be used only as a last effort to control drainage. This limitation is to restrict the placement of clean backfill in an area that may be addressed in the final remedy.** Adding clean backfill may result in an increase in the volume of material that will need to be remediated. Any additional backfill in this area will require consultation with EPA and ODEQ.

Offsite Disposal:
Source material characterization data required to meet specific disposal facility requirements will be described by the ER's chosen landfill and completed by ER prior to loading and hauling material offsite. At a minimum it will include sampling and comprehensive analysis of the following categories: TCLP volatile organic compounds, TCLP metals, TCLP semi-volatile organic compounds, total petroleum hydrocarbons, and reactivity, corrosivity, and ignitibility. TCLP herbicide, TCLP pesticide, and total PCBs will also be collected at the direction of the TSDF. Source material shall be direct loaded into trucks for off-site disposal to the greatest extent possible. To accomplish this ER will collect samples using the excavator and/or shovels in the tank waste source material areas prior to bulk excavation.

Fill Material:
Topsoil:
For topsoil already stockpiled, two composite samples shall be collected for every 20,000 cubic yards. Each composite will be made up of at least 5 aliquots. For undisturbed topsoil, a 5-point composite will be taken in 50 ft by 50 ft. sampling grids. Composite samples include the corners and the center for each sampling grid. Samples shall be collected in at least two different intervals depending on the depth of excavation. Analyses must include SVOCs, VOCs, Metals, and TPH. Topsoil should consist of imported friable loam or silty loam with a minimum 10 percent organic matter (by Loss on Ignition Method), no deleterious concentrations of salts, free of subsoil, roots, grass, weeds, large stone, and foreign matter.
If organic matter amendment if required based on Loss on Ignition Method testing results, ER will amend topsoil with locally sourced organic compost or similar.

Imported Clean Backfill:
For materials that have already been stockpiled, two composite samples shall be collected for every 20,000 cubic yards. Each composite will be made up of at least 5 aliquots. For backfill that have not been disturbed, a 5-point composite will be taken in 50 ft by 50 ft. sampling grids. Composite samples include the corners and the center for each sampling grid. Samples shall be collected in at least two different intervals depending on the depth of excavation. Shallow samples consist of those at 3-24 in and deep samples of 24-48 in. Analyses must include SVOCs, VOCs, Metals, and TPH.
Backfill material should generally consist of clean, ML, CL, or CH material with liquid limit less than 45 and a plasticity index less than 20, SM or SC. It may consist of a mix of organic and inorganic material but should be free of foreign material larger than 3 inches and appreciable amounts of roots, rock, or debris. Moisture content should be sufficient to obtain compaction: between -5% and +3% of optimum. ER will work with the source supplier to determine the details of the backfill material, including obtaining specifications as detailed above; however, it is not expected that ER will collect geotechnical/ soil properties samples and analyses to determine specification including Atterberg limits, standard proctor details, or other characteristics unless there is concern about a specific source area.

Granular Bedding:

Granular Bedding shall consist of clean, well graded, hard particles of crushed limestone, quartzite, or dolomite. **Sources shall be on the latest revision of the Oklahoma DOT Approved Aggregate Supplier List.** Material shall conform to Oklahoma DOT Standard Specification Section 703.06 for Coarse Cover Aggregate. Gradation: Granular Bedding shall conform to the following table.

Sieve Size	Percent Passing
0.5 inch	100
3/8 inch	90 - 100
No. 4	20 - 55
No. 8	0 – 25
No. 16	0 - 10
No. 50	0 - 5

Access Road Surface Aggregate

Access Road Surface Aggregate shall consist of clean, well graded, hard particles of crushed limestone, quartzite, or dolomite. Sources shall be on the latest revision of the Oklahoma DOT Approved Aggregate Supplier List. Material should generally conform to Oklahoma DOT Standard Specification Section 703.05 for Traffic- Bound Surface Course, Type A. Gradation: Surfacing Aggregate shall conform to the following table for Type A.

Sieve Size	Percent Passing
1 inch	100
3/4 inch	95-100
No. 4	5-75
No. 20	0-30
No. 200	0-10

WORKSHEET 18 | SAMPLING LOCATIONS AND METHODS

❖ UFP-QAPP Manual Section 3.1.1 and 3.1.2

Sample Matrix	# Samples [1]	Depth	Composite	Grab	Type 2	Analyte(s) Analytical Method(s)[2] Sampling SOP[3]	Location /Rationale (Comment)
Soil – XRF	TBD	Various	x	x	S	Total Pb	Primarily applicable to lead additive area and pit lead source areas. Guide excavation activities prior to confirmation samples
Soil – Confirmation	75		x		D	Pb and Benzo(a)pyrene	To verify excavation activities are complete and Pb and benzo(a)pyrene concentrations are below the project action levels.
Lead Stabilization	75	NA		x	D	TCLP RCRA metals (at minimum Pb), benzo(a)pyrene based on agreement with TSDF	Confirm non-RCRA material after chemical amendment is added - Lead does not exceed TCLP (5.0 mg/L). Minimum, 1 composite test sample per 1000 CY batch prior to T&D
Waste Profiling	≤10	Various	x		D	TCLP VOC, TCLP SVOC, TCLP metals, TPH, Reactivity Corrosivity Ignitability Paint filter test* TCLP herbicide, TCLP pesticide, and total PCBs may be analyzed at the request of the TSDF	Minimum, 1 composite test sample per 1000 CY batch prior to T&D. Used to characterize waste material for disposal purposes.
Clean Material - Backfill	3	TBD	x		D	TCL VOC, TCL SVOC, TAL Metals Pesticides/PCBs, and Herbicides may be analyzed to verify source material is considered clean of chemical contaminants.	Every 10,000 CY of material if stockpiled or per 50x 50 grid otherwise. To verify material is without contamination and appropriate for use at site
Clean Material - Topsoil		TBD	x		D	TCL VOC, TCL SVOC, TAL metals, TPH, Loss on ignition method (organics)	
Stormwater	≤10	NA		x	D	Total Metals, SVOCs (PAHs), Oil and grease, Ammonia, Chemical Oxygen Demand (COD), pH	Verify that stormwater is free of contaminants prior to release

[1] Number of samples are estimates especially if based on number of samples per specific volume. Does not include QC samples in **Worksheet 20.**

2 Type: Screening (S), Definitive (D), Collaborative (C) (Screening w/10% Definitive)

[2] See **Worksheet 19&30** for list of analytical methods. See discussion in **Worksheet 21** for SOP site specific summary

WORKSHEET 19 & 30 | SAMPLE CONTAINERS, PRESERVATION, AND HOLD TIMES

- UFP-QAPP Manual Section 3.1.2.2

The chemical laboratory will be selected based on three quotes in writing and documented to demonstrate fair and reasonable pricing per the FAR. The request for quotes will summarize the expected number of samples and analyses required to meet site standards and a request for proof of certifications including NELAP or similar state requirements. It is unlikely that a geotechnical/ soil properties lab will be required; however, it is possible if there is concern about a specific type of material the source supplier has available. The agronomics laboratory will be selected based on location (preferably Texas or Oklahoma) and the ability to conduct loss on ignition analyses.

Laboratory name	Analyses	Address /POC	Certification	Delivery Method
TBD	Chemical	TBD	TBD	TBD
TBD	Geotechnical/ Soil properties	TBD	TBD	TBD
TBD - OSU Soil, Water and Forage Analytical Laboratory	Agronomic - Topsoil Organics	TBD	TBD	TBD

Certification: The laboratory used for chemical analysis will have National Environmental Laboratory Accreditation Program (NELAP) accredited or a CLP laboratory.

The QA/QC Lead, T&D Coordinator, or RM will work closely with the subcontracted laboratory to verify appropriate analyses based on project-specific requirements and disposal facility requirements. Generally standard turn-around time (TAT), 5 to 10 business days based on lab, will be used for analysis except for confirmation samples which will have 3-day TAT. TAT may be expedited on select waste disposal samples for each matrix to confirm field test results and confirm bulking of soil and potential bulking of containers.

Parameter	Analytical Method (SW-846)	Containers [1]		Preservative		Prep/Analytical Holding Time[2]	
		Liquid	Solid	Liquid	Solid	Liquid	Solid
Lead	See Metals 6010 below						
	XRF	NA	1 Zip-top baggie	NA	NA	NA	180 days
benzo (a) pyrene	See SVOC or PAH SIM 8270 below						

Parameter	Analytical Method (SW-846)	Containers [1]		Preservative		Prep/Analytical Holding Time[2]	
		Liquid	Solid	Liquid	Solid	Liquid	Solid
TCL Volatile Organic Compounds (VOC)	8260C	2 40-ml Glass vials, polytetrafluoroethylene (PTFE) septa cap Low Level 40-ml Glass vials, PTFE septa cap & stir bar	EnCore/ Methanol 40-ml Glass vials, PTFE septa cap	Cool 4ºC (.008% $Na_2S_2O_3$ if residual Cl_2 present). No headspace, HCl to pH < 2.	EnCore[3] Cool 4ºC Methanol Method 10ml CH_3OH, Cool 4ºC Low Level Method 1gm $NaHSO_4$ & 5 ml of H_20	14 days	EnCore 48 hours to preserve[2], 14 days to analysis Methanol Method 14 days Low Level Method 14 days
TCL Semi-Volatile Organic Compounds (SVOC)	8270D	2 1-Liter Amber Glass	1 8-oz Clear Wide Mouth Glass	Cool 4ºC, (.008% $Na_2S_2O_3$ if residual Cl_2 present)	Cool 4ºC	7 days to extract, 40 days to analysis	14 days to extract, 40 days to analysis
Chlorinated Herbicides[4]	8151A	2 1-Liter Amber Glass	1 8-oz Clear Wide Mouth Glass	Cool 4ºC	Cool 4ºC	7 days to extract, 40 days to analysis	14 days to extract 40 days to analysis
PCBs / Pesticides[4]	8082A/ 8081B	2 1-Liter Amber Glass	1 8-oz Clear Wide Mouth Glass [4]	Cool 4ºC	Cool 4ºC	7 days to extract, 40 days to analysis	14 days to extract, 40 days to analysis
Polynuclear Aromatic Hydrocarbons (PAH)[5]	8270 SIM 8100/8310	2 1-Liter Amber Glass	1 8-oz Clear Wide Mouth Glass	Cool 4ºC, (.008% $Na_2S_2O_3$ if residual Cl_2 present)	Cool 4ºC	7 days to extract, 40 days to analysis	14 days to extract, 40 days to analysis
TAL Metals (Except Mercury)	6010(Soil) 6020(H_20)	1 1-Liter HDPE	1 8-oz Clear Wide Mouth Glass [5]	Cool 4ºC, HNO_3 to pH < 2	Cool 4ºC	180 days	180 days
Mercury (Hg)	7470(H_2O) / 7471(Soil)	1 250-ml HDPE or Glass	1 8-oz Clear Wide Mouth Glass	Cool 4ºC, HNO_3 to pH < 2	Cool 4ºC	28 days	28 days
TPH (GRO, DRO, ORO)	TX Method 1005	NA	1 4-oz amber glass	NA	Cool 4ºC	NA	14 days
Topsoil Fertility (organics)	Loss on ignition	NA	500 g in glass or plastic	NA	NA	NA	1-month pre drying
COD	SM 5220D	250 mL Poly	NA	Cool 4°C H_2SO^4	NA	28 Days	NA

Parameter	Analytical Method (SW-846)	Containers [1]		Preservative		Prep/Analytical Holding Time[2]	
		Liquid	Solid	Liquid	Solid	Liquid	Solid
Ammonia	SM 4500-NH3G / EPA 350.1	250 mL Poly	NA	Cool 4°C H_2SO^4	NA	28 Days	NA
Waste Profile							
TCLP Volatile Fraction	1311/8260	3 40-ml Glass PTFE lined septa	1 2-oz Glass PTFE lined septa (≥ 25 g)	Cool 4ºC, no headspace	Cool 4ºC, no headspace	14 days to TCLP, 14 days to analysis	14 days to TCLP, 14 days to analysis
TCLP Semi volatile Fraction	1311/8270	3 1-Liter Amber Glass	1 16-oz Clear Wide Mouth Glass (CWMG) (≥ 300 g)	Cool 4ºC	Cool 4ºC	TCLP NA. 7 days to extract, 40 days to analysis	14 days to TCLP, 7 days to extract, 40 days to analysis
PCBs[6]	8082A	See Record Above					
TCLP Pesticides[6]	1311/8081B	2 1-Liter Amber Glass	1 8-oz CWMG (≥ 300 g)	Cool 4ºC	Cool 4ºC	14 days to TCLP, 7 days to extract, 40 days to analysis	14 days to TCLP, 7 days to extract, 40 days to analysis
TCLP Chlorinated Herbicides[6]	1113/8151A	2 1-Liter Amber Glass	1 8-oz CWMG	Cool 4ºC	Cool 4ºC	14 days to TCLP, 7 days to extract, 40 days to analysis	14 days to TCLP, 14 days to extract 40 days to analysis
TCLP RCRA metals (except Hg)	1311/6010	1 1-Liter HDPE	1 8-oz CWMG	Cool 4ºC	Cool 4ºC	TCLP NA. 180 days to analysis	180 days to TCLP, 180 days to analysis
TCLP RCRA metals (Hg)	1311/7470	1 1-Liter HDPE	1 8-oz CWMG	Cool 4ºC	Cool 4ºC	TCLP NA. 28 days to analysis	28 days to TCLP, 28 days to analysis
Ignitibility/Flashpoint	1010A/1020B	1 8-oz CWMG	1 8-oz CWMG	None	None	14 Days	14 Days
Corrosivity/pH	9040C/ 9045	500 mL plastic	1 8-oz CWMG	None	None	ASAP	ASAP
Reactivity (CN/ Sulfide)	Chapter 7 9013A/9030B	125 mL plastic bottle	1 8-oz CWMG	Cool 4ºC	Cool 4ºC	14 days CN, 7 days S	14 days CN, 7 days S
Paint Filter	9095B	16 oz Boston Round	NA	None	NA	None	NA

[1] ER will work with selected labs to ensure correct number/ type of sample containers/ mass of sample are collected and appropriate analyses are consolidated.
[2] Hold times are a designated length of time samples are considered representative of the area they were taken before sample preparation or analysis must begin
[3] Encore or similar (terracore) [4] May be collected to verify to pesticide/ PCB/ herbicide contamination in source material
[5]May be collected if PAH reporting limits for laboratory is to high using standard SVOC analysis
[6]May be collected for waste profile at the direction of the TSDF

Link to Hazardous Waste Test Methods (SW-846 Methods): https://www.epa.gov/hw-sw846

WORKSHEET 20 | FIELD QUALITY CONTROL SAMPLE SUMMARY

❖ UFP-QAPP Manual Sections 3.1.1 and 3.1.2.

QC checks of both field sampling and laboratory analysis will be used to assess and document data quality and identify discrepancies in the measurement process that need correction. The quantities and type of QC samples collected will be selected to demonstrate the reliability of the data.

The level of QC provided by the laboratory is based on the analytical method and the laboratory quality system requirements. Laboratories quality control (laboratory control sample (LCS), matrix spike (MS), and surrogate) will be evaluated against the method or laboratory derived criteria. In this case, the lab-generated limits will be reported in the QC section of the analytical report and any exceedances will be noted. Waste profile samples sent to a laboratory do not typically require extensive field QC samples. These sample results will be compared to other like sample results and the field test results for comparability. Results near the regulatory action limit or outside the expected result may require re-sampling or analyses to verify disposal requirements.

If it is determined during data review and verification that quality control limits have been exceeded, those indicators will be evaluated during the data quality assessment process to determine if the data are of the quality necessary to support the project decision. The following is a summary of the types of QC samples that may be collected.

Matrix	Analytical Group	Field Duplicates[1]	Matrix Spikes	Equipment Blanks	Trip Blanks	Other
In-situ Soil (XRF)	Pb XRF	1/ 20 duplicate sample or 3 readings from single baggie	NA	NA	NA	NIST or "RCRA" Standards during calibration checks
Soil – Confirmation	Pb and Benzo(a)pyrene	1/ 20 duplicate samples	1 per 20 as applicable to method	1 per 5% if non-dedicated equipment is used	NA (no VOCs)	NA
Lead Stabilization	TCLP RCRA metals (Pb), benzo(a)pyrene	0	1 per 20 as applicable to method		NA (no VOCs)	NA
Waste material soil	TCLP VOC, TCLP SVOC, TCLP metals TPH, Reactivity Corrosivity Ignitability Paint filter test*	0	1 per 20 as applicable to method		NA	NA
Clean Material (Backfill/ Topsoil)	TCL VOC, TCL SVOC, TAL Metals, pest/PCBs, herbicides	1/ 20 duplicate samples	1 per 20 as applicable to method		1 per cooler (VOC analysis)	Temperature blank:1 per cooler requiring 4°C (unless lab uses sample or cooler temp)
Stormwater	Total Metals, SVOCs (PAHs)	1/20 duplicate sample	1 per 20 as applicable to method	NA	NA	NA

WORKSHEET 21 | FIELD SOPS

❖ UFP-QAPP Manual Section 3.1.2

SOP Number/ Reference	Title, Revision, Date, and URL (if available)	Originating Organization	SOP Option Equipment Modification
2001	General Field Sampling Guidelines, 06/2013	ERT	See Discussion Below for summary of SOP procedures including equipment and modifications
2002	Sample Documentation, 01/2016	ERT	
2013	Surface Water Sampling, 07/2016	ERT	
2017	Waste Pile Sampling,07/2016	ERT	
2049	Investigation-Derived Waste Management, 10/2015	ERT	
1720-20	Operation of the Niton xlt792yw Field Portable X-ray Fluorescence Instrument	ERT	
ERHS01	Air Monitoring and Sampling (IH) – See HASP	ER	
ERHS25	X-Ray Radiation Protection Program	ER	
Appendix D contains select ER sampling-related SOPs that may be used during site activities. Link to Environmental Response Team (ERT) SOPs: http://epaosc.org/site/site_profile.aspx?site_id=2107			

Below is a summary of the field sampling procedures to be used during field activities. Field activities will be conducted in strict accordance with the HASP. Sample collection activities for assessment of personal exposure will adhere to applicable National Institute for Occupational Safety and Health (NIOSH) and Occupational Safety and Health Administration (OSHA) method specifications. H&S analytical data will be entered into the ER Industrial Hygiene database, which will be maintained by ER's H&S personnel, who are responsible for Occupational Exposure Limit-related sampling activities. Refer to the project HASP for additional information regarding exposure limits, personal protective equipment (PPE) requirements, and emergency procedures. At minimum, samplers will use clean gloves during the collection of samples.

Soil Sampling Procedure

Surface soil samples will usually be collected from a depth of 0-6 inches (below ground surface) using stainless steel hand augers, bowls, and spoons. This procedure is also used for confirmation samples after excavation of contaminated material. Any debris or vegetation will be removed prior to sample collection. Composite samples for non-volatiles analysis, in accordance with Worksheet 17 sampling rationale for each type of sample, may be collected by combining subsamples in a stainless-steel bucket and thoroughly homogenizing. All reusable equipment exposed to the soil samples are constructed of stainless steel and decontaminated before each use (see decontamination procedures below). Samples will be placed in appropriate sample containers. Samples for VOC analysis (for clean fill material) will be collected first using an EnCore sampler (or similar), followed by sampling for non-volatile analysis using a stainless-steel scoop or trowel. Sample descriptions will be logged in the field logbook or form with standard geologic descriptions as appropriate to site data needs. All surface soil sample locations will be photographed and documented during sampling activities.

Grab or composite samples collected for XRF analysis may be collected directly into the sample baggie. The sample will be homogenized by manipulating the outside of the bag to ensure that the material is free of organics and rocks and that clumps of soil are broken up.

Homogenization: Mixing of the sample for non-VOC parameters is necessary to create a representative sample media. It is extremely important that solid samples be mixed as thoroughly as possible to ensure that the sample is as representative as possible of the sample location. Use the "quartering" technique which consists of dividing the sample into quarters and thoroughly mixing each quarter and then mixing the quarters together. This procedure is repeated several times until the sample is homogenous.

Subsurface Soil Sampling Procedure

Prior to performing subsurface activities, public utilities will be located, as necessary. Subsurface soil samples/aliquots may be collected using an excavator to access material at depth. Reusable sampling equipment exposed to the soil samples are constructed of stainless steel and decontaminated before each use (see decontamination procedures below). Homogenization of sample aliquots will follow the procedure described above. Subsurface sample locations will be photographed and documented during sampling activities.

Stormwater Sampling Procedure

Stormwater sampling will be conducted by immersing the sample bottles directly into the sample media. If the stormwater is not deep enough to collect a full sample, an additional sample bottle may be used/ modified at each location to collect sample and before placing in the appropriate containers. Field parameters, which include pH, temperature, and electrical conductivity, may be measured for each sample collected. Data will be recorded on appropriate sample forms or in a site-specific logbook or field form. Sampling will be conducted from the farthest downstream location to the farthest upstream location to minimize the potential for cross contamination. Stormwater sample locations will be photographed and documented during sampling activities.

In-Situ Soil Sampling Procedures

Samples for XRF analysis will be collected by directly placing material in the sample container or placing the XRF analyzer on the material in-situ. Reusable equipment exposed to the soil samples are constructed of stainless steel and decontaminated before each use (see decontamination procedures below). Results and sample descriptions will be logged in the field logbook or form with standard geologic descriptions as appropriate to meet site data needs. Soil sample locations will be photographed and documented during sampling activities, including marking locational data within the excavation on a site sketch.

Equipment Decontamination Procedure

Sampling and monitoring equipment will be mobilized to the site within a sanitary container or stored within a controlled environment to avoid contamination and ensure maintenance of data. Reusable sampling equipment (hand augers, spoons, stainless steel mixing bowls, etc.) will be decontaminated before sampling commences, between each discreet sample location, and prior to leaving the site. The effectiveness of decontamination procedures is documented using equipment rinsate blanks, which are generally collected at a frequency of once per day per matrix per field crew as defined in the SAP. Disposable sampling equipment will be used whenever practical to minimize the need for decontamination.

The decontamination procedure will include the following:

- Wash equipment with Alconox soap and tap water.
- Rinse with tap water.

- When sampling for inorganic contaminants: Rinse with dilute (0.1N) hydrochloric or nitric acid. (Note: Dilute hydrochloric acid is preferred over nitric acid when cleaning stainless steel because nitric acid can oxidize stainless steel.)
- Rinse with distilled water or deionized water.
- When sampling for organic contaminants: Rinse with pesticide-grade, reagent-grade isopropyl alcohol.
- Allow equipment to air dry and wrap in clean plastic.

Decontamination by-products will be handled by combining rinse with appropriate remediation-derived waste for disposal or treatment.

WORKSHEET 22 | FIELD EQUIPMENT CALIBRATION, MAINTENANCE, TESTING, AND INSPECTION

- ❖ UFP-QAPP Manual Section 3.1.2.4

Verification of Activities: QA/QC Lead/ T&D Coordinator and RM
Responsible Person (including calibration): ER field personnel; assign office personnel for continued maintenance/ ensure manufactures calibration
SOP Reference: Instrument User's Manual, ERT Quick Start Guides (QSG)/ Equipment Operating Guides (EOGs)

Field Equipment	Calibration Activity	Maintenance	Testing[1]	Frequency	Acceptance Criteria	Corrective Action
MSA Altair 5X PID Multi-gas with PID with electronic data storage (or similar)	Calibrate with Zero Air; span calibrate with multi-gas	Check/ replace battery	Bump Test	Daily before use; if anomaly suspected	Automatic (Pass/ Fail) Reproducibility: LEL <50 % (3 %) LEL 50-100 % (5 %) CH4 <2.5 % (0.15 %) CH4 2.5-5.00 % (0.25 %) O2 0 – 30 % (0.7 %) CO*: ±5 ppm or 10 % of reading H2S*: ±2 ppm H2S or 10 % reading PID* ±10 ppm or 20 % of reading *whichever is greater	Check gas expiration/ check sensor/ follow directions on equip/manual
Niton XRF	Check factory calibration per user manual	Check battery, clean window/replace	Calibration Check + NIST Stnds	Daily before use	Per user manual	Per user manual
DataRAM[1]	Select auto 0/ Initialize	Change Dust Filter	NA	On regular basis, or when visual dust noted on filter	NA	Change Sensor or Factory Service& Calibration
Personal Air Pump with Dry-cal Equipment	Dry calibrate flow rate	Check battery and operational	Within flow rate of test method	Prior to day's activities	Test method dependent	Charge or replace
Sampling Tools	NA	Clean non-dedicated equipment prior to/after use	Inspect for damage or defects	Before use	Repeat decontamination as needed	Replace as needed

[1] Used for Perimeter monitoring if deemed necessary by EPA
ERT EOGs & QSGs: https://response.epa.gov/site/site_profile.aspx?site_id=0001

WORKSHEET 23| ANALYTICAL SOPs

- ❖ UFP-QAPP Manual Section 3.2.1

SOPs: Quality Manual for chemical analyses lab will be attached once lab is selected
Screening/Definitive: XRF is field screening data. Other methods/ data in the following table are definitive.

Title, Revision Date, and/or Number and URL (if available)	Analytical Group /Matrix	SOP Equip.
Method 1311: Toxicity Characteristic Leaching Procedure (TCLP), July 1992	**TCLP:** Soil, Sediment, Debris, Water	Extraction
Method 8260C: Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS), 09/2006	**VOC:** Soil, Sediment, Debris, Water	GC/MS
Method 8270D: Semi volatile Organic Compounds by GC/MS, 02/2007	**SVOC:** Soil, Sediment, Debris, Water	
Method 6010C: Inductively Coupled Plasma-Atomic Emission Spectroscopy (ICP-AES), 11/2000	**Metals (no Hg):** Soil, Sediment, Debris	ICP-AES
Method 6020A: Inductively Coupled Plasma-Mass Spectrometry (ICP-MS), 02/2007	**Metals (no Hg):** Water, Air	ICP-MS
Method 7470A: Mercury in Liquid Waste (Manual Cold-Vapor Technique), 09/1994	**Mercury:** Water	Cold Vapor Atomic Absorption
Method 7471B: Mercury in Solid or Semisolid Waste (Manual Cold-Vapor Technique), 02/2007	**Mercury:** Soil, Sediment, Debris, Air	
Method 8081B: Organochlorine Pesticides by Gas Chromatography (GC), 02/2007	**Pesticides:** Soil, Sediment, Debris, Water	GC
Method 8082A: Polychlorinated Biphenyl (PCBs) by GC, 02/2007	**PCBs:** Soil, Sediment, Debris, Water	
Method 8151A: Chlorinated Herbicides by GC, 12/996	**Herbicides:** Soil, Sediment, Debris, Water	
Method 9010/9012: Total and Amenable Cyanide: Distillation, 11/2004	**Cyanide:** Soil, Sediment, Debris, Water	Distillation/ Titration
Method 2310L: Acidity (as $CaCO_3$)	**Acidity:** Liquids	Titration
Method 9040C/9041: pH Electrometric Measurement, 11/2004	**pH:** Soil, Sediment, Water	Electrode
Method 1110: Corrosivity Toward Steel, Nov. 2004	**Corrosivity:** Liquids	NA
Method 1010/1030: Test Methods for Flashpoint by Pensky-Martens Closed Cup Tester, 11/ 2004	**Flashpoint:** Water	Closed Cup
Method 9095B: Paint Filter Liquids Test, Nov. 2004	**Paint Filter:** Liquids	NA
Method 6200M: Field Portable XRF Spectrometry for the Determination of Elemental Concentrations in Soil/Sediment	Screening	**Metals** Soil

WORKSHEET 24| ANALYTICAL INSTRUMENT CALIBRATION

- ❖ UFP-QAPP Manual Section 3.2.2

See Worksheet 22 for field equipment calibration. The responsibility for calibration of laboratory equipment rests with the selected laboratory. Each type of instrumentation and EPA-approved method have specific calibration procedures, based on the analytes of interest and the sample medium. Calibration procedures and frequencies will be in accordance with requirements established by the EPA. NELAP accredited laboratories are required to maintain QA manuals and method specific SOPs documenting calibration requirements, CAs and preventative maintenance frequency. The laboratory QAM is responsible for ensuring that laboratory instrumentation is maintained in accordance with specifications. Laboratory SOPs and/or a Lab Quality Manual will be attached once the lab is selected. The Lab Manager/ analyst is responsible for the following corrective actions.

Instrument/ Calibration Procedure	Frequency	Acceptance Criteria	Corrective Action (CA)
GC/ GC/MD 8081B, 8082A, 8151A	ICAL after instrument set up, then if daily 12-hour calibration verification criteria are not met.	Target compounds: initial r^2 >0.995; and calibration verification % difference <15%	Inspect system, correct problem, re-run calibration / affected samples
GC/MS 8260C, 8270D	ICAL after instrument set up, then if daily 12-hour calibration verification criteria are not met.	Target analytes: initial r^2 >0.99; and % difference <15% (TA) <30% (CCC); ICV within ± 30%	
CVAA 7470A, 7471B	Daily ICAL prior to sample analysis. Perform instrument re-calibration 1/yr min. CCV every 15 samples and end of analysis sequence.	R2 ≥0.995 for linear regression; Analytes within ± 10% expected value	
ICP/ ICP-MS 6010C, 6020A	Calibration & ICV after instrument set up, then daily. CCV 10% or every 2 hours, which is more frequent	Calibration: r^2 >0.995; ICV & CCV: ± 10% of true values	
ICP-AES 6010C	Calibrate & ICV after instrument set up then daily; CCV upper range (UR) w/in 10%. New UR limits determined when significant change in instrument response or every six months. LLCCV stnd 30%.	Linear regression correlation coefficient ≥0.995 ICV & CCV: ± 10% of upper range true values and ± 30% LLCCV true values.	

CCC	Calibration Check Compound	GC	Gas Chromatography	PLM	polarized light microscopy
CCV	continuing calibration verification	GC/MS	Gas Chromatograph/ Mass Spectroscopy	ICP-AES	inductively coupled plasma atomic emission spectroscopy
CF	calibration factor	HPLC	high performance liquid chromatography		
CVAA	Cold Vapor Atomic Absorption	ICAL	initial calibration	TEM	transmission electron microscopy
EDX	Energy Dispersive X-Ray	ICP	Inductively coupled plasma		

NFGs: https://www.epa.gov/clp/superfund-clp-national-functional-guidelines-data-review
SW846 Methods: https://www.epa.gov/hw-sw846

WORKSHEET 25| ANALYTICAL INSTRUMENT AND EQUIPMENT MAINTENANCE, TESTING, AND INSPECTION

- ❖ UFP-QAPP Manual Section 3.2.3

Analytical methods and instrument inspection listed here link to analytical methods in **Worksheet 18** and **Worksheet 19&30**
Laboratories conducting sample analyses collected under the contract are NELAP accredited, or similar, and have a preventative maintenance program covering testing, inspection, and maintenance procedures with a schedule for each measurement system and required support activity. Instruments are maintained according to manufacturer's operation requirements. Laboratory SOPs or a Lab Quality Manual may be required from the laboratory to verify their procedures for equipment maintenance, testing, and inspection comply with method requirements and will be attached once the lab is selected. The basic requirements and components of such a program include the following examples. The laboratory analyst is responsible for the following corrective actions.

Instrument	Maintenance	Testing	Inspection	Frequency	Accept. Criteria	Corrective action	SOP
GC & GC/MD	Replace disposables, bake out instrument, condition column	See analytical method & instrument manufacture's recommendations	Check connections, perform leak tests	Daily or as needed	Continuing calibration verification pass criteria	Inspect system; correct problem; re-run calibration & affected samples	8081B 8082A 8151A
GC/MS							8260C 8270D
CVAA	Replace disposables, flush lines, check lamp current & gas flow	Sensitivity check	Instrument performance and sensitivity			Recalibrate	7470A 7471B
ICP-AES	Replace disposable, flush lines, & clean auto sampler	Analytical standards					6010C
ICP & ICP-MS	Replace pump windings & gas tanks, check standard & sample flow	Monitor instrument standard (ISTD) counts for variation		As needed	Monitor ISTD counts for variation	Replace windings, recalibrate & reanalyze	6010C 6020A

AES atomic emission spectroscopy
CVAA Cold Vapor Atomic Absorption
GC Gas Chromatography
MD Multi-detector
MS Mass Spectroscopy
ICP inductively coupled plasma
HSE/NPL Health and Safety Executive/ National Physical Laboratory

WORKSHEET 26 & 27 | SAMPLE HANDLING, CUSTODY AND DISPOSAL

- ❖ UFP-QAPP Manual Section 3.3

Sampling Organization: ER
Laboratory*:* TBD (based on award of laboratory RFQ)
Method of sample delivery (shipper/carrier): TBD based on laboratory location
Number days from reporting to sample disposal: Samples will be held and disposed of per laboratory SOP (usually a minimum of 30 days).

Activity	Organization & Position Responsible	SOP
Sample Labeling	ER Field Sampling Team and QA/QC Lead/ T&D Coordinator	ERT2002
Chain-of-Custody Form Completion	ER Field Sampling Team and QA/QC Lead/ T&D Coordinator	ERT2002
Sample Packaging	ER Field Sampling Team and QA/QC Lead/ T&D Coordinator	Lab guidance
Shipping Coordination	ER QA/QC Lead/ T&D Coordinator	NA
Sample Receipt, Inspection, & Log-in	Subcontract Lab Sample Custodian	Lab SOPs/QAPP
Sample Custody and Storage	Lab Sample Custodian /Lab Analytical Personnel	
Sample Disposal	ER Field Personnel (IDW and field testing) Lab Sample Custodian /Lab Analytical Personnel	

Supplies and Consumables:
Supplies and consumables used in the collection of field samples and field measurements will consist of field measurement equipment, calibration standards, sampling equipment, PPE, sample containers shipping materials and coolers, de-ionized water, and reagents. Supplies will also consist of field supplies for implementing cleanup strategy including geotechnical liners, rock, and aggregate. Supplies and consumables will be received at an ER office, the EPA Warehouse or onsite. When supplies are received, the RM or project QA/QC Lead will sort the supplies according to vendor, check packing slips against purchase orders, applicability to the requirements specified in this plan and site specifications, and inspect the condition of supplies before the supplies are accepted for use on a project. Supplies for personnel protection and H&S monitoring will be inspected by the site SSO for conformity to the project HASP. If the supplies do not meet the acceptance criteria, deficiencies will be noted on the packing slip, purchase order, and site logbook. The item will then be returned to the vendor for replacement or repair. Incomplete or late orders may result in partial payment or disqualification of the vendor for future purchases.

Sample Handling:
Chemical preservative are used when they do not interfere with the analysis. Sample preservation is intended to retard biological action, retard hydrolysis and chemical compounds and complexes, and reduce volatility of constituents.

Sample containers and preservatives for environmental samples will be provided by the laboratory, unless emergency circumstances preclude this possibility. In this case, ER will only use containers that are certified clean (having a certificate of analysis) and preservatives of known and documented purity. The ER QA/QC Lead will be responsible for ensuring that the proper containers and preservatives are ordered. Pre-qualified laboratories will be required to have procedures in place to certify the cleanliness of sample containers and the purity of their

preservatives. Sample containers and preservatives are assembled prior to mobilization. Preservatives are placed in sample containers if analyte and sampling techniques permit their use.

When samples are collected for off-site analyses, they will be sent to the laboratory within 24 hours of collection, whenever practicable, to ensure that the most reliable and accurate answers will be obtained as a result of the analyses. Samples are collected according to the appropriate SOP, and sample volume must be sufficient for the analysis. Samples designated for off-site analysis will require samples to be collected in accordance with specified method criteria. Samples collected for multiple analytes may require lesser volume by combining analytes per sample bottle. All samples will be collected and preserved in accordance with specific method requirements. After the sample(s) have been taken, preservative is added immediately, if not added to the sample container prior to sample collection. For composite, sampling, each aliquot should be preserved at the time of collection. When automated samplers are used, preserve after compositing and sample splitting is completed. Sample(s) are to be maintained at 4°C (±2°) during sampling and packaging. Containers, preservatives, and holding times requirements specified by the USEPA SW-846 are presented in Worksheet 19&30.

Field Sample Documentation:

The number and type of samples collected will be recorded on field forms and/or in field logbooks. All hardcopy entries will be made in waterproof permanent ink, and no erasures will be allowed. If an incorrect entry is made, the information will be crossed out with a single strike mark, dated, and initialed. Whenever a sample is collected or a measurement is made, a detailed description of the location shall be recorded. The number of photographs taken and identifiers will also be noted. Equipment used to make measurements will be identified along with the date of calibration.

Samples will be collected following the sampling procedures documented in this plan. The equipment used to collect samples will be noted along with the time of sampling, sample description, volume, and number of containers. Sample points will be located on a topographic map with the aid of a Global Positioning System (GPS) enabled device, if appropriate, after sample collection. This procedure will allow documentation of changes in sample locations as they occur in the field due to unanticipated site conditions.

Sample Identification

Sample Identification will be based on the type of sample collected and the number of samples collected. For instance, stockpiles will use the stockpile ID. Samples collected from the excavation for field testing will at minimum contain the anomaly area and excavation depth and other information deemed necessary during site activities to provide a unique identifier.

Sample Nomenclature

Identifier	Detail	Feature
XXX ETF LPA WPA	Material Source Name East Tank Farm Lorraine Process Area Wilcox Process Area	Area
	Named based on size (for grid/ zone samples only)	Grid /Zone[1]
Number	Depth of excavation/ subsurface depth of sample	Depth

Sample Nomenclature

Identifier	Detail	Feature
TP BF SW SO CF WS OA	Topsoil Backfill Storm Water Soil Confirmation Soil Waste Profile Outdoor Air	Matrix
###	Incremental Number[2]	Unique Identifier
_MMDDYY	Date	

The following information shall be recorded using black, waterproof ink in the sample logbook or field form when in-situ measurement or samples for laboratory analysis are collected:

- location of sample/ measurement collection
- date and time of measurement
- samples taken if any
- field observations
- level of personnel protection (if required)
- equipment used to make physical measurements and collect samples

Each sample collected for laboratory analysis will have a completed sample label with the following information:

- Project (EPA TO) Number
- Sample Number
- Sample collection date and time
- Sample medium/matrix and type (grab/composite)
- Preservative
- Analytical method
- Sampler's initials

Custody Procedure:

Sample custody and transfer procedures will be consistent with established regional guidelines. Along with the field logbook/ field forms, the Chain of Custody (COC) form is used to track and document unbroken custody of samples as identified by the unique sample number. Samples sent to the laboratory will be accompanied by a COC form. The COC will include the ER point of contact, sample numbers and locations, requested analytical methods, and the turn-around time (TAT) based on project needs. Standard TAT is 10 business days unless project needs; however, based on site needs, ER will expedite confirmation samples. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents transfer of custody of samples from the sampler to another person, to a mobile laboratory, to the permanent laboratory, or to/from a secure storage area. The original COC form will be kept by the receiving laboratory and will accompany the analytical report and a copy will be placed in the project files.

ER will use EPA ERT's SCRIBE software to manage the sample collection, documentation, and submission of all relevant reports on projects with a large volume of generated data. An ER COC

form is also included as **Appendix C**.

Samples will be properly packaged for shipment and dispatched to the appropriate laboratory for analysis, with a signed COC enclosed. A copy of the COC will be retained by the sampler for reference. Shipping containers will be locked and secured with strapping tape and a minimum of two signed and dated custody seals for shipment to the laboratory. The preferred procedure includes use of a custody seal attached to the front right and back left of the cooler. The custody seals are covered with clear plastic tape. The cooler is strapped shut with strapping tape in at least two locations.

The designated laboratory sample receipt clerk is authorized to accept samples and is charged with the responsibility for proper completion of the required sample receipt documentation. Analysts are assigned to assist the sample receipt clerk in sample log-in procedures. In all cases, the COC and analytical request documents become part of the permanent file relative to the samples collected. Those files are retained indefinitely in the laboratory's facility. A record of the custody change is made by the analyst and checked by the Sample Custodian at the time the sample is taken from the cold storage. Internal custody files are retained indefinitely in laboratory files.

WORKSHEET 28| ANALYTICLA QUALITY CONTROL AND CORRECTIVE ACTION

- ❖ UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6

Field and laboratory QC samples and measurements will be used to verify that analytical data meet project specific MPC, which are based on PQOs/DQOs. Field QC samples and measurements and laboratory QC samples will be used to assess how they influence data quality. See Worksheet 12 and 20 for descriptions of QC samples, DQIs, and MPC. The following table documents typical method specific and/or NFG specific acceptance limits and CAs.

Responsible Person for CA: Laboratory Analyst/ Supervisor
Project-Specific MPC: Laboratory generated limits for laboratory control sample (LCS), MS/MSD, and surrogates will be provided once lab is selected and will be used for verification as described in Worksheets 34 through 36.

Method/Matrix Concentration	Lab QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	DQI
SW846 1311 TCLP Soil/ Waste Low, Medium, High	Method Blank	1 per ≤ 20 samples	Method dependent	Stop analysis until requirements met	Accuracy
	Matrix Spike	1/ waste type	Method dependent	Check calculations and instruments, reanalyze affected samples	Accuracy
	Extraction Time Limits	All samples	VOC; N/A SVOC; 7 days Hg; N/A Metals; N/A	Make sure samples are extracted within appropriate time constraints	Accuracy
SW846 8260B VOCs Aqueous Soil Waste Low Medium High	Method Blank	1 every 12 hours	No analyte > RL	Stop analysis until requirements met	Accuracy
	Matrix Spike	1 per ≤ 20 samples	Analyte specific	Flag outliers in conjunction with other QC criteria.	Accuracy
	Matrix Spike Dup.	1 per ≤ 20 samples	Analyte specific		Precision
	Internal Standards**	All Samples	Sample ISTD area must be -50% to +100% From CCV, + 30 sec retention time shift	Check calcs/ instrument, reanalyze affected samples; up to 3 DMCs per sample allowed to exceed limit; qualify as necessary	Accuracy
	Lab Control Sample	1 per ≤ 20 samples	70-130 %R %RPD < 20	Reanalyze if possible; Flag outliers	Accuracy Precision
	Field Duplicate	1 per ≤ 20 samples	%RPD < 20	Flag outliers	Accuracy
	DMC (Surrogate) Compounds	All Samples	Analyte specific	Check calcs/ instrument reanalyze affected samples; up to 3 DMCs per sample allowed to exceed limit. Qualify per NFG	Accuracy
SW846 8270D SVOCs Aqueous	Method Blank	1 per ≤ 20 samples	< RL; except Bis(2-ethylhexyl)phthalate < 5x RL	Stop analysis until requirements met	Accuracy
	Matrix Spike	1 per ≤ 20 samples	Analyte specific		Accuracy

Method/Matrix Concentration	Lab QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	DQI
Soil Waste Low-Low (SIM) Low Medium High	Matrix Spike Dup.	1 per ≤ 20 samples	Analyte specific	No action is taken on MS/MSD data alone. Qualify data in conjunction with other QC criteria	Precision
	Internal Standards	All Samples	Area count 50-200% 12 hr stnd ± 30 sec retention time shift	Check calculations and instruments, reanalyze affected samples	Accuracy
	Lab Control Sample	1 per ≤ 20 samples	Same as Matrix Spike MPC Same as Matrix Spike Duplicate MPC	Flag outliers	Accuracy Precision
	DMC (Surrogate) Compounds[1]	All Samples	Analyte specific	Check calculations and instruments, reanalyze affected samples	Accuracy
SW846 8081B Pesticides Soil Waste Water Low Medium High	Method Blank	1 per ≤ 20 samples	< RL	Stop analysis until requirements met	Accuracy
	Matrix Spike	1 per ≤ 20 samples	Analyte specific	No action taken on MS/MSD data alone. Qualify data in conjunction with other QC criteria	Accuracy
	Matrix Spike Dup.	1 per ≤ 20 samples	Analyte specific		Precision
	Surrogate Compounds	All samples	All surrogates: 30-150 %R	Check calcs and instrument, reanalyze affected samples; qualify as necessary	Accuracy
	Lab Control Sample	1 every 12 hours (1 per batch)	Analyte specific	Flag outliers	Accuracy
SW846 8082A PCBs Aqueous Soil Waste Low Medium High	Method Blank	1 per ≤ 20 samples	< RL	Stop analysis until requirements met	Accuracy
	Matrix Spike	1 per ≤ 20 samples	Analyte specific	No action is taken on MS/MSD data alone. Qualify data in conjunction with other QC criteria	Accuracy
	Matrix Spike Dup.	1 per ≤ 20 samples	Analyte specific		Precision
	Surrogate Compound	All samples	30-150 %R	Check calcs and instrument, reanalyze affected samples; qualify as necessary	Accuracy
	Lab Control Sample	All samples	Analyte specific		Accuracy
SW846 8151A Herbicides Aqueous Soil Waste	Method Blank	1 per ≤ 20 samples	< RL	Stop analysis until requirements met	Accuracy
	Matrix Spike	1 per ≤ 20 samples	70-130 %R	No action is taken on MS/MSD data alone. Qualify data in conjunction with other QC criteria	Accuracy
	Matrix Spike Dup.	1 per ≤ 20 samples	70-130 %R		Precision
	Surrogate Compounds	All samples	2,4-dichlorophenylacetic acid: 70-130 %R		Accuracy

Method/Matrix Concentration	Lab QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	DQI
Low Medium High	Lab Control Sample	1 per ≤ 20 samples	70-130 %R	Check calculations and instruments, reanalyze affected samples; qualify as necessary	Accuracy
SW846 6010C /7471 Metals/ Mercury Aqueous Soil Waste Low Medium High	Preparation Blank	1 per ≤ 20 samples	No constituent > RL	Suspend analysis until source rectified; re-digest & reanalyze affected samples; use professional judgment to qualify	Accuracy
	Instr. Calibration	Per Method	90-100%	Suspend analysis	Accuracy
	Matrix Spike	1 per ≤ 20 samples	<30% R; < 75 %R; or >125 %R	Qualify as necessary	Accuracy
	Duplicate	1 per ≤ 20 samples	< 20 %RPD**		Precision
	Post-Digestion Spike	After failed MS/MSD %R	80-120 %R		Accuracy
	ICP Serial Dilution	1 per ≤ 20 samples	< ± 10 %D 1:5 Dilution		Accuracy
	Interference Check Sample	Beginning, during, and after analysis	Within ± 2 times RL or ± 20% of true value, whichever is greater except Al, Fe, Ca, K, Mg, Na	Check calculations and instruments, reanalyze affected samples	Accuracy
	Laboratory Control Sample	1 per ≤ 20 samples (Every 12 hours)	70-130 %R; Except Ag & Sb: 40-170 %R	Suspend analysis until source rectified; re-digest/ reanalyze affected samples, Qualify as necessary	Accuracy
	Internal Standard (ICP-MS)	All samples	Yttrium & Scandium 60-125 %RI	Qualify as necessary	Accuracy

RSD relative standard deviation
CRQL Contract Required Quantitation Limit
DMC deuterated monitoring compound
HEM Hexane Extractable Material
ISTD instrument standard
MS/MSD Matrix Spike/Matrix Spike Duplicate
NFG National Functional Guidelines
RL Reporting Limit
RPD relative percent difference
SGT Silica Gel Treated

EPA NFG: http://www2.epa.gov/clp/contract-laboratory-program-national-functional-guidelines-data-review (RL = CRQL for CLP laboratory)
Link to SW-846 Methods: https://www.epa.gov/hw-sw846S

WORKSHEET 29 | PROJECT DOCUMENTS AND RECORDS

❖ UFP-QAPP Manual Section 3.5.1

Controlled documents include policies, SOPs, manuals, work instructions/plans, and other documents that describe how tasks are performed and controlled. Technical and quality records generated and retained are objective evidence of actions taken or observations made while implementing field activities and the quality management system. These include photographs, Daily Work Reports, Field Logbook or Data Collection Sheets, Chain-of-Custody (COC) Forms, Corrective Action Reports, Correspondence, Field Sample Results/Measurements, Tailgate Safety Meeting Items, Waste Profile Sheets, and Waste Manifest(s). Audits, assessments, and management system reviews (MSRs) are also controlled by ER. ER complies with the following sections description during the development, collection, maintenance, distribution, and storage of documented information.

The following records will be generated and verified by ER personnel and stored electronically on the ER intranet and in the on-site project file during site activities, as described in the Region 6 QMP. The following table provides additional locations where files will be maintained and stored. The RM is responsible for ensuring the collection, assembly, and inventory of documents for their project.

Record	Generation	Verification	Location
Sample Collection and Field Records			
Photographs	RM/ Field Personnel	RM	Project electronic file system
Daily Work Orders/Reports	RM/ Foremen	RM	
Field Logbook or Data Collection Sheets	Foremen/ QA/QC Lead	RM, QA/QC Lead, T&D Coordinator	Project hard copy file system
Correspondence	Field Personnel	PM, RM	Email system
Areas of excavation, sample locations	Field Personnel	Field personnel	Logbook
Survey data GPS Coordinates	QA/QC Lead	RM	Project electronic file system
EPA 1900-55 Forms	FCA	RM	Project electronic file system
COC Forms/ Custody Seals	Project QA/QC Lead/ Field sampling team	RM, QA/QC Lead/ T&D Coordinator	Project hard copy file system
Air Bills/ Receipt of samples form			
Deviations			
Field Sample Results/Measurements	Project QA/QC Lead	RM	Scribe and Project electronic file system
Laboratory Data Package/ Validation	Subcontractor Lab	QA/QC Lead T&D Coordinator	
Tailgate Safety Meeting Items	RM/Field Personnel	H&S, RM	Project hard copy file system
Sign-In/ Sign-Out Sheet			
Equipment checklist	Operator	RM	Project hard copy file system
Waste Profile Sheets/ Waste Manifest(s)	RM	QA/QC Lead, T&D Coordinator	Project hard copy file system
Final CERCLA Off-Site Disposal Report			

*Project specific personnel will be assigned to generation/verification based on site complexity and type of data. Verification personnel will be qualified to review data and will be different from persons generating data.
Project assessment, laboratory records (generated and internally assessed by the lab) are detailed in Worksheet 29

Data Management

At the project level, quality management records are created and reviewed by the project team and approved/authenticated by the RM and/or QA/QC Lead prior to release for use. The PQM may periodically review documents and records outside the project-level review. The RM is also responsible for ensuring site documents and records and associated transmittal log are maintained on-site, as appropriate. Hardcopy and original documents are retained at a dry secure location at the office designated for working or retention. These documents are transferred to the STL office file retention area as soon as feasibly possible.

ER encourages the use of electronic format documents to reduce the use of paper products. In general, records and documents, including contracts, SOPs, and project plans are maintained electronically on ER's secure SharePoint website or network system based on the type of document or record. Quality documents and records submitted to EPA are typically submitted in electronic form via email, with the email retained as submission verification. Hard copies of project plans, other reference documents for site activities, and records created during site activities will be maintained on-site for easy access to personnel. ER also understands that paper versions are necessary in some situations like when electronic devices are unavailable during field activities. Hardcopy records created on-site will be scanned at the earliest convenience. The electronic file system and paper file system are mirrored so records are easily accessible using either method and completeness can be verified. This system also allows flexibility if internet access is limited on-site.

During the course of work, obsolete and/or draft deliverables will be retained in accordance with the records schedule for the particular type of document. Once the retention time has expired, the documents will be deleted/destroyed unless ER opts to retain an outdated version as record of specific project details or recommendations that have been superseded. Controlled ERRS quality documents are retained for this purpose. If obsolete, superseded, or draft deliverables are retained, they will be marked and moved to an "Archive" folder.

Data collected on site will be recorded on the field forms, Instrument Calibration Logs, and field logbooks. These data records will become a part of the project file.

The EPA ERT SCRIBE software will be used for data management purposes including key field test results, number of containers collected by type (as described in the work plan), and laboratory analytical results. Commercially available spreadsheet and database software may also be used for tracking material brough on-site and material sent for disposal. Laboratory Data Deliverables will be received as electronic data deliverables (EDDs) and a Data Report (PDF). The EDD ensures that the data can be formatted quickly with minimal chance of typographic errors. The QA/QC Lead will maintain the Scribe processing of ER data. Scribe Data Manager may be used to automatically verify valid values and completeness of data. A level 2 package consists of a narrative, the sample results sheets (Form Is), and additional summary forms for the laboratory QC samples performed. The QA/QC Lead, T&D Coordinator assists the response manager in selecting the appropriate level of data package. Typically, a Form 2 report (waste disposal purpose

where limited QA is required) or will be provided. The minimum requirement for the laboratory is the delivery of a SEDD Stage 2a deliverable. Worksheet 36 provides detail of which laboratory data will require Level 2 versus Level 4 data packages.

Sampling data will be reviewed by the ER QA/QC Lead or T&D Coordinator. Unacceptable results will immediately warrant CA procedures. Data are released for decision-making purposes only after approval of the QA/QC Lead/ T&D Coordinator. Upon approval by the QA/QC Lead/ T&D Coordinator and following a QA/QC review, analytical results will be submitted to the ER RM. The results will include a tabulation of the analytical data and an explanation of field conditions or laboratory QA/QC problems and their effects on data quality. Results of performance audits and system audits will also be included, as appropriate. Proposed CA will be recommended if QA problems are identified during review of data quality or results of performance or system audits.

Due to the iterative nature of investigation and remediation activities, data will be presented to the EPA in the interim in the form of tables, figures, laboratory analytical reports, and a brief letter report presenting conclusions, updating the COR, and proposing additional work, if necessary. Following project completions, ER will submit a report summarizing activities as requested by EPA and may include a summary of activities, final disposal summary, and tabulated results of all field and analytical data.

Report Review Process

Peer reviews are conducted during the preparation of a report on select areas and on select topics to evaluate performance, improve quality, and resolve professional differences of opinions. Peer reviews may be performed on program documents, implementation procedures, research studies, technical reports, and special assignments. In general, each review is unique, has individual objectives, and requires the use of individual methodologies and technical skills. Due to the unique nature of these reviews, the PM evaluates the qualifications of potential reviewers to ensure only properly qualified peer reviewers are selected. Each peer review will be formally documented and signed by the reviewers.

WORKSHEET 31, 32 & 33 | ASSESSMENTS AND CORRECTIVE ACTION

❖ UFP-QAPP Manual Sections 4.1.1 and 4.1.2

Internal Assessment Type	Responsible Person for Review & CAs	Evaluation	Frequency/ Audit Date	Deliverable/ Due Date[1]
Daily Safety Tailgate/ review of work	RM/SSO	• Review Job Hazard Analysis (JHA) for tasks scheduled for that day • Discuss previous issues	Daily during field activities	Tailgate Safety Form and JHA Form - immediately
Daily QC	RM	• Review current and previous DWO • Verify QC issues resolved	Daily during field activities	Punch list form - immediately
Field Sampling/ COC Review	QA/QC or T&D Coordinator	• Review sampling activities and completion based on this document • Review COC for accuracy/ completeness	Daily if sampling	Email to RM of sampling status within 1 day
Lab Data Review	QA/QC or T&D Coordinator	• Lab Data Review • Data package received • TAT achieved • Proper COC • Correct analytical method • Hold times not exceeded • Lab QC sample results within limits	Within day of data package received (per data package)	Findings Memo/ within 2 days of data package receipt Summary Report if required by TO
Data Validation	QA/QC	• Review results of data validation to determine usability of data	2 days of validation received	Report to RM
Field Instrument Documentation Assessment (TSA)	RM	• Internal Calibration complete & accurate • Standards are not expired • Duplicates are accurate • QC checks performed and within limits • Documentation complete • Calculations & entries are complete • COC maintained	Complete review each day of use as instrument is calibrated/ operated	Checklist - Daily

[1]Reports will be prepared by ER. Distribution will include the ER RM, PM and PQM, QA/QC Lead/ T&D Coordinator, and the EPA CO, COR, and Delegated QA Approving Officer, as applicable.

Additional audits, as discussed in the Region 6 QMP, may be completed based on site performance. Factors determining the scope and frequency for audits include complexity of the TO, project duration, degree of specified QC, criteria to achieve DQOs, subcontractor participation, criticality of data collection and frequency/potential of nonconformance. These audits will be used to verify that measurement systems are operating properly, assess whether data quality is adequately documented, confirm the adequacy of data collection systems, and evaluate management effectiveness to meet QA guidelines.

QA Management Reports Table				
Type of Report	**Frequency**	**Projected Delivery Date**	**Person(s) Responsible for Report**	**Report Recipients**
DWO, reports quality issues	Daily	Daily	RM	EPA COR
Monthly Report includes quality assessments and issues reporting	Monthly	TBD	RM	EPA Contract Officer
Monthly summary of QA/QC activities/ audit findings	As applicable	TBD	PQM	PM and RMs

WORKSHEET 34| DATA VERIFICATION AND VALIDATION INPUTS

- ❖ UFP-QAPP Manual Section 5.2.1 and Table 9

The following information are typically used to complete verification and validation.

	Description	Verification (completeness)	Validation (conformance to specs)
Planning Documents/Records			
1	Approved QAPP	X	
2	Field SOPs	X	
3	Laboratory SOPs	X	
4	Laboratory QA Manual	X	
5	Laboratory Certifications	X	
Field Records			
6	Field Logbooks	X	X
7	Equipment Calibration Records	X	X
8	COC Forms	X	X
9	Sampling Diagrams	X	X
10	Change Orders/Deviations	X	X
11	Field Audit Reports	X	X
12	Field Corrective Action (CA) Reports	X	X
Analytical Data Package			
13	Cover Sheet (laboratory identifying information)	X	X
14	Case Narrative	X	X
15	Sample Receipt Records	X	X
16	Limit of detection (LOD)/ Limit of Quantitation (LOQ) meet requirements	X	X
17	Definition of Laboratory Qualifiers	X	X
18	Results Reporting Forms	X	X
19	QC Sample Results	X	X
20	Electronic Data Deliverable	X	X

WORKSHEET 35 | DATA VERIFICATION PROCEDURES

- UFP-QAPP Manual Section 5.2.2

Records Reviewed	Required Documents	Process Description	Responsible Person
Approved QAPP	Project specific QAPP, QMP, Contract	Verify completeness, correctness, and contractual compliance of project QA/QC and data set against the methods, SOPs, and contract requirements.	PQM
Field SOPs		Ensure that field sampling SOPs were followed.	QA/QC Lead, T&D Coordinator, RM
Analytical SOPs	Project specific QAPP, SOPs	Ensure that laboratory analytical SOPs were followed.	Lab PM
Laboratory Certifications	Project specific QAPP	Ensure lab(s) has current State, NELAP, or other certifications as required by project.	QA/QC Lead, T&D Coordinator, RM
Field Logbook/ Forms Records	Project specific QAPP, QMP, Contract	Verify records are present and complete for each day of field activities. Verify samples (including field QC) were collected; documentation for sample locations/time, monitoring, or deviations are present. Use logbook checklist for completeness.	QA/QC Lead, T&D Coordinator, RM
Equipment Calibration		Ensure field analytical and lab SOPs for equipment calibration were followed.	QA/QC Lead, T&D Coordinator, RM, Lab PM
COC Forms		Verify completeness of COC records. Examine consistency with field logbook. Check for appropriate methods, preservation, TAT, sample volume (including QC samples [MS/MSD]). Verify required signatures/dates are present. Check for transcription errors.	QA/QC Lead, T&D Coordinator' RM' Lab PM
Reports & correspondence		Verify relevant reports are present and complete for each day of field activities. Verify correspondence are documented and were reported in accordance with requirements.	PQM, QA/QC Lead, T&D Coordinator, RM
Field test results		Verify data is complete. Check if physical characteristics are consistent with test results. Check if results are consistent with results from other like materials. Check if test results are consistent with analytical data for disposal	QA/QC Lead, T&D Coordinator, RM
Laboratory Deliverable		Verify lab deliverable contains records specified in the QAPP. Check sample receipt records to ensure sample condition and missing/broken sample containers were noted/ reported. Compare data package & COCs to verify all collected samples have results. Ensure narrative has QC exceptions described. Check for evidence that notifications were provided to project personnel as specified in the QAPP. Verify necessary signatures and dates are present.	QA/QC Lead, T&D Coordinator, RM
Audit Reports, CA Reports		Verify that planned audits were conducted. Examine audit reports. For deficiencies noted, verify that CA was implemented according to plan.	PQM, QA/QC Lead, T&D Coordinator, RM, Lab PM
Analytical Data (Lab)	Data Package	Data produced by the laboratory will undergo review at the lab to verify completeness and ensure the appropriate analyses, calculations, and QC were completed and required forms and data are included for each data package based on data package type.	Lab Project Manager

WORKSHEET 36 | DATA VALIDATION PROCEDURES

- ❖ UFP-QAPP Manual Section 5.2.2

Data validation, in accordance with National Functional Guidelines is not expected for ER data generated on this project. The QA/QC Lead/ T&D Coordinator will, at minimum, will review laboratory data packages as describe in **Worksheet 35** and **Worksheet 37**. The review may include evaluating data according to some NFG parameters.

Analytical Group/ Method	Typical Data Deliverable Requirement	Analytical Specifications	MPC	% Data Packages to be Validated	% Raw Data Reviewed	% Results to be Recalculated	Validation Procedure	Validation Code[1]	Electronic Validation Program/ Version
Confirmation Laboratory Analytical	Level IV	Soil – Pb and benzo(a) pyrene	Worksheet 11, 12, 19 & 30, 28	10%	TBD	TBD	NFG	TBD – Stage 4	TBD
Lead Stabilization	Level IV	Soil- TCLP and benzo(a) pyrene		10%	TBD	TBD	NFG	TBD- Stage 4	TBD
Waste Profiling	Level II	Soil	Lab QC/ RCRA stnd.	0%	0%	0%	NA	NV	NA
Clean material	Level II min	Soil – TCL VOC, SVOC, TAL Metals	Worksheet 11, 12, 19 & 30, 28	TBD	TBD	TBD	TBD	TBD	SBD
Stormwater	Level II min	Water	Lab QC/ NPDES	0%	0%	0%	NA	NV	NA

[1] Potential Validation Codes:
Stage_2A_Validation_Electronic S2AVEStage_2A_Validation_Manual S2AVM
Stage_2A_Validation_Electronic_and_Manual S2AVEMStage_2B_Validation_Electronic S2BVE
Stage_2B_Validation_Manual S2BVMStage_2B_Validation_Electronic_and_ Manual S2BVEM
Stage_3_Validation_Electronic S3VE
Stage_3_Validation_Manual S3VM
Stage_3_Validation_Electronic_and_Manual S3VEM
Stage_4_Validation_Electronic S4VE
Stage_4_Validation_Manual S4VM
Stage_4_Validation_Electronic_and_ Manual S4VEM
Not_Validated NV

For data that will be validated, the validator will receive the data packages electronically. Additionally, the validator will be required to submit final validation reports via pdf format and must provide an annotated laboratory analytical result EDD with applicable data validation qualifiers and/or result value modifications. It is expected that a combination of manual and electronic validation will be completed, as approved by EPA prior to data validation. The validation code and process used be the validator will be used based on the validator selected and the EPA requirements for this project in accordance with EPA *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use* (January 2009). For instance, stage 4 validation may be electronic, manual, or a combination.

Level II data packages will be required for waste disposal/ profiling analytical results and does not require a full (Stage 4 data validation) unless directed by the COR. Data will be reviewed by the

QA/QC Lead or T&D Coordinator or PQM for Stage 1 and Stage 2A items including laboratory specific QC requirements as documented in the project specific QAPP.

In addition to data validation specified in the above table, if the data review raises questions about the quality of the data, project validation may be completed by a person qualified based on the level of validation selected. The guidelines to be used for data validation will be the latest revision of EPA's NFG for data Validation of Organics and Inorganics in conjunction with the project specific QAPP, appropriate ER SOPs, and the laboratory's SOPs. If it is determined during data review and data verification that quality control limits have been exceeded, those indicators will be further evaluated during the data quality assessment process to determine if the data are of the quality necessary to support the project decision. Validation guidelines and communication between stakeholders will determine the usability of the data. Data limitations will be detailed in a memo or in the final site report. If the data user has questions about the data validator's report, the data user may go back to the data validator and request further explanation or information. A focused validation that provides more detail may be required to determine usability.

WORKSHEET 37 | DATA USABILITY ASSESSMENT

❖ UFP-QAPP Manual Section 5.2.3 and Table 12

Personnel responsible for participating in the data usability assessment will include the ER Project QA/QC Lead/ T&D Coordinator and may include RM, PQM, and other internal or external subject matter experts as needed.

In general, deficiencies found during a QC data review, verification or data review/validation that could potentially affect the site decision process will be reported to the COR. For instance, waste disposal data review will verify that the results detection limits are less than the appropriate disposal level. If detection limits are greater than the appropriate regulatory level, the COR will be immediately notified to determine if additional actions are necessary.

The following items will be reviewed to assure that the data usability assessment evaluates whether underlying assumptions used during systematic planning are supported, sources of uncertainty have been accounted for and are acceptable, data are representative of the population of interest, and the results can be used as intended, with the acceptable level of confidence:

- Review the project's objectives and sampling design
- A QA/QC review of field generated data and observations
- Individual data verification/ validation reports as directed by EPA
- Review of the procedures used by the validator (if completed) to qualify data for reasons related to dilution, reanalysis, and duplicate analysis of samples
- Evaluation of QC samples such as field blanks, trip blanks, field duplicates, and matrix spike laboratory control samples to assess the quality of the field activities and laboratory procedures
- Assessment of the quality of data measured and generated in terms of accuracy, precision, and representativeness (compare planned and actual DQI criteria)
- Evaluate actual Laboratory Reporting limits to required standards or site limits.
- Compare sampling and analysis activities to project specific DQIs and site objectives/goals
- Deviations from project specific QAPP
- Summary of the usability of the data and conclusions based on the assessment of data conducted.

See Worksheet 12 for DQI calculations and a general description of the reconciliation of data.

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APPENDIX A

SITE FIGURE

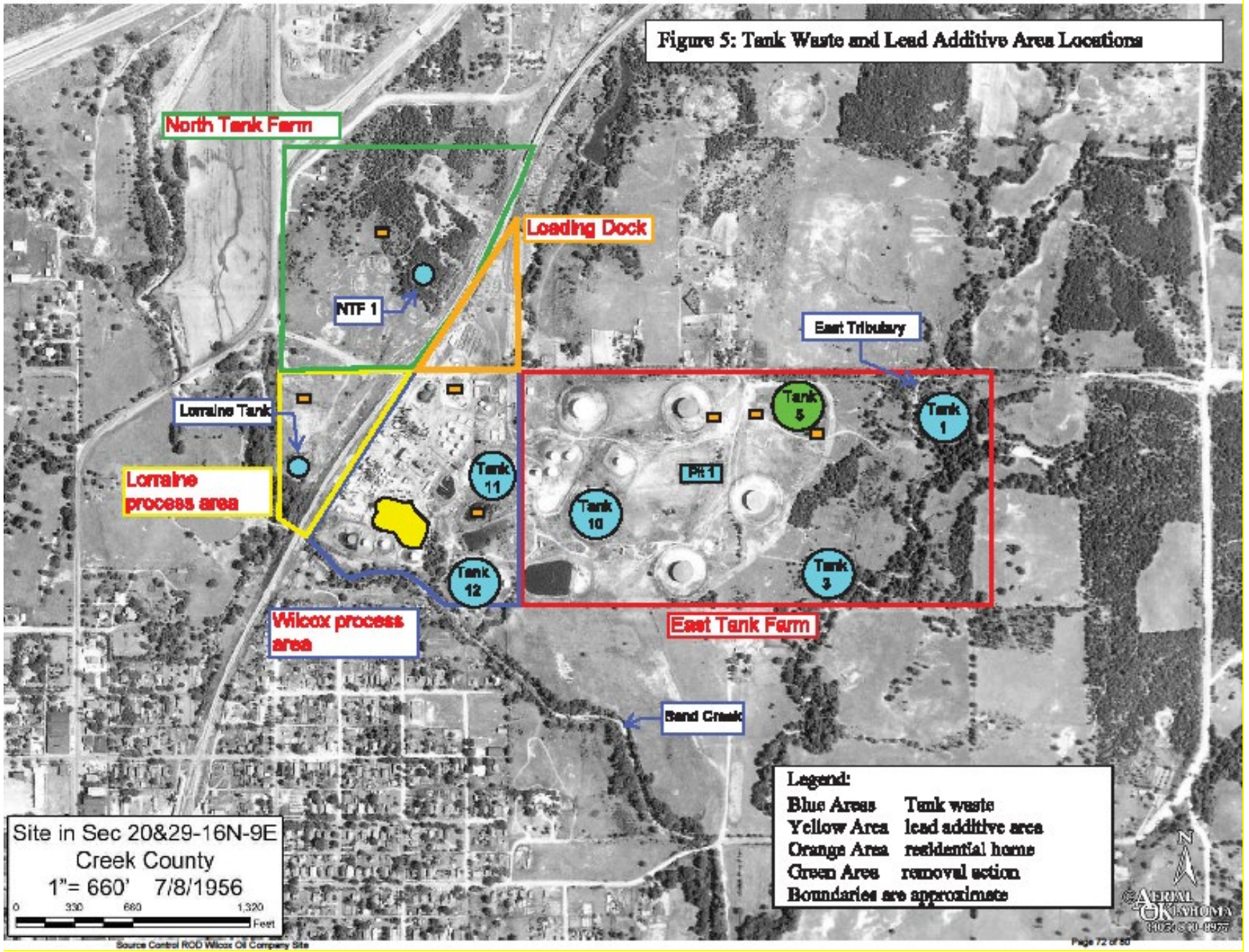
Figure 5: Tank Waste and Lead Additive Area Locations
North Tank Farm
Loading Dock
NTF 1
East Tributary
Lorraine Tank
Lorraine process area
Tank 5
Tank 1
Tank 11
Pit 1
Tank 10
Tank 12
Tank 3
Wilcox process area
East Tank Farm
Sand Creek
Site in Sec 20&29-16N-9E
Creek County
1"= 660' 7/8/1956
0 330 660 1,320
Feet
Legend:
Blue Areas Tank waste
Yellow Area lead additive area
Orange Area residential home
Green Area removal action
Boundaries are approximate
N
Source Control ROD Wilcox Oil Company Site

APPENDIX B

QAPP Changes

Version	Date Modified	Brief Description
Draft	12/4/20	Submitted QAPP to EPA for comments and approval

APPENDIX C

Field Forms and Checklists

ER Chain of Custody
XRF Calibration Form

CHAIN OF CUSTODY

COC No. ER_____

Page ____ of ____

Headquarters:
1666 Fabick Drive
Fenton, MO 60326
Tel: 636-227-7477
Fax: 636-227-6447

ER Office/ Send Results To:
Contact:
Address:
City: State: Zip:
Email/phone:
☐ Mail ☐ Fax ☐ Verbal ☐ E-mail

Lab Info:
Lab:
Address:
City: State: Zip:
Contact:
Email/phone:

Project Name:
City/State:
Project Number:
Project Manager:
Phone:
Email:

Deliverable:
Check all that apply
☐Results Only PDF
☐Level II
☐Level III
☐Level IV
☐EDD
☐CLP-like
☐Add:

Billing Information (if different):
Contact:
Address:
City: State: Zip:
PO #: Email:

Sampler(s) Name/Sign/Phone:

Turn Around Time:
☐5 Business days ☐24 Hours ☐Other:
☐10 Business days ☐48 Hours
Date needed:
*Notify Lab if Rush is required (if < 10 days)

Matrix *
S Solid/Soil
P Product
W Waste
GW Groundwater
SW Surface Water
DW Drinking Water
WW Waste water
WP Wipe

Air Matrix:
C Charcoal
SG Silica Gel
F Membrane Filter
Cy Cyclone
B Badge
I Impinger

User Defined:

ER Sample ID	Date	Time	Matrix*	Volume (L)	Comment	# of Pres. Bottles: None	HCl	HNO3			Total # Containers	Grab (G)/Composite (C)									Lab Use

Comments/Special Instructions:

Airbill No:

Relinquished by (signature):	Date/Time	Received by(signature):	Date/Time
Relinquished by (signature):	Date/Time	Received by(signature):	Date/Time
Relinquished by (signature):	Date/Time	Received by lab(signature):	Date/Time

DAILY CALIBRATION LOG

Date: _____

XRF Niton XL3T 300

Serial Number: _____

Technician: _____

Project: _____

Energy Calibration Check:

	Time	Reading
Power Up:		
Power Down:		

Note: Power Down Energy Calibration must be within 20% of Power Up Calibration. If variance exceeds 20% Contact Thermo Niton for product support. Energy Calibration must be within 20% of Initial product calibration of 174.0

Field Calibration Check: (60 seconds)

	NIST 2780 (5000 ppm)	+/-	RCRA (500 ppm)	+/-
Reading 1				
Reading 2				
Reading 3				
Average				

Note: Field Calibration check of Niton Standards must be within 20% of the known Standard Concentrations. The average +/- error must be less than 20% of the reading value.

Name: _____
Print

_____
Sign

APPENDIX D

Standard Operating Procedures

ERHS01	Air Monitoring and Sampling (IH)
ERHS25	X-Ray Radiation Protection Program

ERT SOPs https://response.epa.gov/site/site_profile.aspx?site_id=2107

Links to Manufacturer Operating Procedures for Equipment used during field activities:

MSA AltAir 5X Multi-gas with PID	http://s7d9.scene7.com/is/content/minesafetyappliances/ALTAIR%205X%20PID%20Operating%20Manual%20-%20GB
DataRAM	https://semspub.epa.gov/work/05/912459.pdf
XRF	https://www.manualslib.com/manual/1405327/Thermo-Scientific-Niton-Xl3t-500.html?page=7#manual
ERT EOG Link	https://response.epa.gov/site/doc_list.aspx?site_id=0001s

1.0 PURPOSE

This program describes minimum requirements for an air monitoring and sampling program to identify and evaluate worker exposures to hazardous substances at ER field jobsites. Use of this procedure complies with federal and state OSHA regulations in 29 CFR 1910 and 1926.

2.0 CONTAMINANT SELECTION

The selection of specific airborne contaminants for monitoring and sampling is based on the chemical substances and concentrations present in each work operation. This information is obtained from historical site records and pre-startup job site evaluations.

A task-specific hazard analysis is performed for the proposed scope of work. This hazard analysis is included in the site-specific safety and health plan.

3.0 SITE CHARACTERIZATION

3.1 Preliminary Evaluation

A preliminary evaluation of each jobsite's characteristics will be performed by the project supervisor and the site safety representative prior to on-site work. This information will be used in task-specific hazard analyses and to aid in the selection of appropriate personal protection. The preliminary evaluation will focus on hazardous substances and health hazards present or anticipated at the site.

The following additional information, to the extent available, will also be obtained prior to on-site work:

- Location and approximate size of the site;
- Description of the proposed work activities;
- Duration of the work activities;
- Site topography;
- Site accessibility by air and roads;
- Potential pathways for hazardous substance dispersion; and
- Present status and capabilities of local emergency response organizations, including hospitals, ambulance, fire, police and spill response.

3.2 Detailed Evaluation

During initial site entry, a more detailed evaluation of site-specific characteristics will be performed by the site safety and health officer to further aid in the selection of personal protective equipment and engineering controls for the tasks to be performed.

Based on the preliminary evaluation, air monitoring will be conducted to identify any Immediately Dangerous to Life and Health (IDLH) or other potentially dangerous conditions such as; the presence of flammable atmospheres, oxygen-deficient environments, toxic levels of airborne contaminants, and radioactive materials. The monitoring will be performed with direct-reading instruments such as; combustible gas, oxygen, or hydrogen sulfide meters, colorimetric detector tubes, photo ionization detectors, flame ionization detectors, or ionizing radiation detectors.

This monitoring will be repeated when contaminants change, work begins on a different portion of the site, a different type of operation is initiated (i.e., drum opening instead of well drilling), or when employees begin handling leaking drums or containers, or working in areas with obvious free liquid contamination (i.e., spills, ponds).

3.3 Quality Control

Primary or secondary standards will be used to perform field calibration checks on air monitoring equipment in accordance with the manufacturers' instructions. Instruments that fail these field calibration checks will replaced immediately and returned for repair to ER's Field Services group or to the manufacturer.

4.0 PERSONAL SAMPLING

4.1 Sample Selection

After hazardous substance operations begin, personal air sampling will be performed on employees who have the highest potential for exposures to those hazardous substances most likely to be present above established exposure limits. Since work crew size varies significantly, a representative sampling approach will be used, by job title and by work shift. This will require that at least one air sample be collected for each job task selected for monitoring.

4.2 Sampling and Analytical Methods

NIOSH Sampling and Analytical Methods will be used for personal air sampling. Samples to be analyzed will be sent to a laboratory accredited by the American Industrial Hygiene Association (AIHA) for analysis of the specified contaminants.

4.3 Pump Calibration

Personal sampling pumps will be calibrated before and after sampling using a primary standard airflow calibration or a rotameter calibrated to a primary standard. A filter cassette or sorbent tube assembly of the same type used to collect air samples will be attached to the pump during calibration. This will compensate for air flow resistance due to the sampling media. Sampling media used for pump calibration will be discarded and fresh media will be used for actual air samples and blanks. Pumps that fail to maintain calibrated flow rates within 10 percent of the original flow setting will be replaced and returned for repair to ER's Field Services group or to the manufacturer.

4.4 Quality Control

Personal exposure samples will be submitted to AIHA-certified laboratories for analysis. These labs participate in proficiency analytical testing and performance audits by AIHA in order to receive and maintain such certification.

At least one field blank will be submitted to the analytical lab with each shipment of air samples. Blanks will be of the same media as that used to collect air samples. Blanks will be labeled with their own unique sample numbers.

A chain-of-custody form will be completed for each day of sampling. These forms will show the unique sample numbers, including sample numbers for appropriate field blanks. Chains-of-custody will also show the sample collection date, shipping date, project number and location, names of persons collecting and processing the samples, and dates that each individual was in possession of the samples.

Air sampling calibrations, collection data, and results will be recorded on the attached forms. Copies of these forms, the chain-of-custody, and the lab analytical results will be placed in the project-specific files and in the affected ER, employees' occupational medical files, to document exposure histories.

5.0 EXPOSURE CONTROL MEASURES

The results of air monitoring and sampling will be compared with OSHA Permissible Exposure Limits (PELs), ACGIH Threshold Limit Values (TLVs), and NIOSH Recommended Exposure Limits (RELs). If these results are outside acceptable limits, job tasks will be reexamined to identify and control the source of exposure. Control methods may include engineering and administrative measures, or changes in personal protective equipment and respirators.

6.0 PERSONNEL NOTIFICATION AND RECORDKEEPING

ER employees will receive written notice of the results of their personal air sampling. Notices will be sent out within 5 days after the results are received. Copies of these notification letters will be included in the associate's occupational medical file.

7.0 QUALIFICATION OF MONITORING PERSONNEL

Air monitoring and sampling will be performed by employees trained on the required monitoring and sampling instruments. This training must include use, limitations, calibration and maintenance of air monitoring and sampling instruments; as well as quality control, storage, and shipping procedures for air samples. Equivalent training and work experience may also be accepted as qualification for air monitoring and sampling personnel. This training and experience must be evaluated and approved by the safety and health staff before the individual is assigned to perform air monitoring or sampling.

1. Purpose

The purpose of this Radiation Protection Program (RPP) is to keep radiation exposures to workers using a portable, X-Ray Tube based Thermo NITON Analyzer XL3t at Environmental Restoration to levels that are as low as reasonably achievable (ALARA), and

Ensure that use of the NITON Analyzers is in compliance with all applicable State and Federal regulations.

2. Scope

This RPP applies to any use of NITON Analyzers at Environmental Restoration, *LLC.*

3. Responsibilities

Luke Wisniewski shall be designated as the individual in charge of the RPP. Luke Wisniewski will be responsible for maintaining and implementing the RPP which will minimize the risks associated with using portable X-Ray producing machines and which will ensure compliance with the regulations of the Nebraska.

The specific actions to be performed by the individual in charge are as follows:

- Receive Radiation Safety Training at a one day course provided by Thermo NITON Analyzers or by a qualified expert. This will be documented by a certificate of completion which is to be kept on file with other RPP documents
- Maintain a list of authorized users and ensure that only authorized users operate the Analyzers.
- *Notify staff of additions to or subtractions from the authorized user list.*
- Schedule and/or conduct training for employees prior to authorizing their use of the NITON Analyzer without direct supervision. Maintain records of training including a copy or a summary of the training material. Training shall include Radiation Safety, Operational, and Emergency Procedures.
- *If personal exposure monitoring (dosimetry) is part of the RPP, then the Individual in charge will be responsible for maintaining dosimetry records.*
- Ensure that all users are following appropriate operating procedures while using Analyzers.
- Maintain manufacturer provided instruction manuals, and operations and maintenance records.
- Ensure proper disposal of unneeded Analyzers.
- Ensure that labels on Analyzers are intact and legible. Notify NITON for assistance with labeling that is damaged or illegible.
- *Review, as needed, the RPP content, implementation, and effectiveness.*

Authorized Workers are responsible for using only approved safe techniques and procedures in operations involving the Analyzer. The specific actions to be performed are as follows:

- Follow proper operating procedures as described in training and ensure other individuals also adhere to these requirements.
- Ensure that the label on the Analyzer is in tact and legible.
- *Ensure proper use of dosimetry, if dosimetry is issued.*
- Be familiar with emergency procedures and know how to recognize and terminate unsafe operations.

4. Safe Operating Procedures

A copy of the Users Manual or Operating and Emergency Procedures shall be made available to all workers using the NITON Analyzer. A copy will be kept with the Analyzer and another copy shall be kept on file with other RPP records.

Only authorized personnel with training on state regulations, operating and emergency procedures shall be allowed to operate the NITON Analyzer. All authorized personnel are responsible for complying with the requirements of this RPP and will report any and all incidents involving the NITON Analyzer to the individual in charge.

The operator is responsible for ensuring that no part of a person's body is at or near the measurement point, and no closer than one foot during a measurement (trigger finger excluded).
The operator must be aware that the NITON Analyzer is emitting radiation when lights are flashing.
The operator must be aware that radiation in the primary beam could eventually cause physical harm if the device is used improperly and must be able to recognize the symptoms which would begin with skin reddening in the exposed area and at higher doses would appear as a burn or localized tissue damage.
Prior to each use:

- The operator will inspect and maintain the Kapton window and all labels on the NITON Analyzer
- *The operator will fill out the utilization log (if required)*

Environmental Restoration will maintain a log documenting use of the Analyzer that contains, at a minimum, the unit serial number, date/time removed, date/time returned, and responsible individual. At the front of this log will also be a list of authorized users. Refer to Appendix A for example.

5. Emergency Procedures

In any case where one suspects that the x-ray tube remains on when the measurement is terminated:

- Disconnect the battery pack immediately to turn off the x-ray tube, and
- Call Thermo Electron Corporation's Service Department in the United States, toll free, at (800) 875-1578.

Suspect accidental exposure to primary beam
Notify the Individual in Charge and RSO at 314 280-8328
Individual in charge will asses impact and call NITON RSO for assistance if necessary
Severe Physical Damage
There is no radioactive material so a fire or severe damage poses no radiation hazard.

6. Radiation Safety Training

The Individual in charge will be responsible for receiving Radiation Safety Training from Thermo NITON Analyzer LLC 1 day training, or a qualified expert. It will then be this individual's responsibility to train the rest of the workers, whether the workers are trained by the individual in charge, Thermo NITON Analyzer LLC, or by a qualified expert. This training will be documented by a sign-off sheet that includes the topics covered in the radiation safety training which is to be kept with all the RPP documents.

7. Personnel Monitoring

Personal exposure levels may, as determined by the responsible individual or as required by state regulations, be monitored utilizing dosimetry providers accredited by the National Voluntary Laboratory Accreditation Program (NVLAP). Badges are not transferable. The following are a few examples of NVLAP accredited labs:

- *Environmental Restoration will use AEIL, 9251 Kirby Drive, Houston, TX 77054*
- *Dosimeters shall only be worn by the individuals they are issued to and shall only be worn during occupational hours.*
- *Never wear the badge during non-occupational exposures such as during medical x-rays or any medical procedures involving radiation.*
- *Dosimeters should be protected from extremes of heat, moisture, and pressure.*
- *Dosimeters shall be stored in a protected area to prevent loss, damage, and other sources of radiation.*

8. Posting and Labeling

There is a relatively low radiation hazard associated with the Analyzer, and because the authorized user will be with the Analyzer at all times it is operational, posting radiation area signs will not be necessary. A copy of the Nebraska Notice to Employees will be kept in the Analyzer case as well as on file with other RPP documents and will be available for review at any time.
The label on the Analyzer will be checked periodically by the Individual in charge as well as the workers using the Analyzer. The label will be checked for integrity and legibility. If the label becomes faded, worn, damaged, or defaced, the Analyzer will be promptly returned to Thermo NITON Analyzers LLC for relabeling.

9. Record Keeping

The individual in charge will be responsible for all the records associated with the RPP. These records will be kept in an identified location and will be made available for review by any worker or state official upon request. The following is a list of records that will be kept at minimum:

- Personnel training records
- Manufacturer provided instruction manuals and service & maintenance records
- Authorized Users
- State Analytical X-Ray Regulations and Notice to Radiation Workers
- *Analyzer usage log*
- *Personnel Dosimetry Records, if dosimetry is required*

10. Quality Assurance / Annual Review

At the minimum, items on the following list will be done annually:

- *Radiation Safety Review for all workers*
- *Operational & Emergency Procedures Review for all workers*
- *Audit of the RPP content, implementation, and effectiveness*

11. References:

- DOE G 441.1-5 “Radiation-Generating Devices Guide”
- Thermo NITON Analyzers Sample Radiation Safety Program
- NBS Handbook 111, Revised 1977
- Radiation Safety Topics “Writing a Radiation Protection Program For the Industrial X-Ray Program For a Facility with Cabinet Radiographic or Analytical X-Ray Machines”
- Table 11.4.9 “Good Work Practice for X-Ray Diffraction and X-Ray Fluorescence Units” The Health Physics and Radiological Health Handbook

Appendix A

Utilization Log

Serial #	Date	Time Out	Time Returned	Reason	Responsible Individual

APPENDIX E

EPA Residential RSLs Compared to Example Lab Reporting Limits

Volatile Organic Compounds – Soil

Analyte	CAS Number	Residential Summay RSL (ug/kg) THQ=1	Carcinogenic RSL[1] (ug/kg)	Achievable Laboratory Limits[2,3]				
				Houston Lab 1			Houston Lab 2	
				MDL	LOD	QL	MDL	QL
1,1,1-Trichloroethane	71-55-6	8,100,000 ns	*NS*	0.503	1	5	0.5	5
1,1,2,2-Tetrachloroethane	79-34-5	600 c	600	0.470	1	5	0.8	5
1,1,2-Trichloro-1,1,2- trifluoroethane	76-13-1	6,700,000 ns	*NS*	0.426	1	10	0.7	5
1,1,2-Trichloroethane	79-00-5	1,100 c**	1,100	0.392	1	5	0.5	5
1,1-Dichloroethane	75-34-3	3,600 c	3,600	0.376	1	5	0.5	5
1,1-Dichloroethene	75-35-4	230,000 n	*NS*	0.277	1	5	0.5	5
1,2,3-Trichlorobenzene	87-61-6	63,000 n	*NS*					
1,2,4-Trichlorobenzene	120-82-1	24,000 c**	24,000				1.0	5
1,2-Dibromo-3- Chloropropane	96-12-8	5.3 c	5.3	0.704	1	5	1.0	5
1,2-Dibromoethane	106-93-4	36 c	36	1.04	5	5	0.5	5
1,2-Dichlorobenzene	95-50-1	1,800,000 ns	*NS*	0.943	1	5	1.0	5
1,2-Dichloroethane	107-06-2	460 c*	460	0.304	1	5	0.6	5
1,2-Dichloropropane	78-87-5	2,500 c**	2,500	0.198	1	5	0.8	5
1,3-Dichlorobenzene	*541-73-1*	*NS*	*NS*				*1.0*	*5*
1,4 Dichlorobenzene	106-46-7	2,600 c	2,600				1.0	5
2-Butanone (Methyl Ethyl Ketone)	78-93-3	27,000,000 n	*NS*	3.65	5	20	1.3	10
2-Hexanone	591-78-6	200,000 n	*NS*	2.13	5	10	1.4	10
4-Methyl-2-pentanone (Methyl Isobutyl Ketone)	108-10-1	33,000,000 ns	*NS*	2.61	5	50	2.0	10
Acetone	67-64-1	61,000,000 n	*NS*	11.1	25	100	2.0	20
Benzene	71-43-2	1,200 c*	1,200	0.207	1	1	0.5	5
Bromochloromethane	74-97-5	150,000 n	*NS*	0.526	1	5		
Bromodichloromethane	75-27-4	290 c	290	0.251	1	5	0.5	5
Bromoform	75-25-2	19,000 c*	19,000	1.03	5	5	0.6	5
Bromomethane	74-83-9	6,800 n	*NS*				1.0	10
Carbon disulfide	75-15-0	770,000 ns	*NS*	0.292	1	5	0.6	10
Carbon tetrachloride	56-23-5	650 c	650	1.64	5	5	0.6	5
Chlorobenzene	108-90-7	280,000 n	*NS*	0.237	1	5	0.6	5
Chloroethane (Ethyl Chloride)	75-00-3	14,000,000 ns	*NS*	0.444	1	10	0.8	10
Chloroform	67-66-3	320 c	320	0.173	1	5	0.5	5
Chloromethane	74-87-3	110,000 n	*NS*	0.431	1	5	0.5	10
cis-1,2-Dichloroethene	156-59-2	160,000 n	*NS*				0.8	5
cis-1,3-Dichloropropene (542-75-6)	10061-01-5	1,800 c*	1,800				0.5	5
Cyclohexane5	110-82-7	6,500,000 ns	*NS*	1.44	5	5	1.0	5
Dibromochloromethane	124-48-1	8,300 c	8,300	0.895	1	5	0.5	5
Dichlorodifluoromethane	75-71-8	87,000 n	NS	1.11	5	5	0.7	5
Ethylbenzene	100-41-4	5,800 c	5,800	0.336	1	1	0.7	5
Isopropylbenzene (cumene)	98-82-8	1,900,000 ns	*NS*	0.174	1	5	0.9	5
m&p-Xylene	*179601-23-1*	*NS*	*NS*	*0.800*	*2*	*2*	*1.6*	*10.0*

Volatile Organic Compounds – Soil

Analyte	CAS Number	Residential Summay RSL (ug/kg) THQ=1	Carcinogenic RSL[1] (ug/kg)	Achievable Laboratory Limits[2,3]				
				Houston Lab 1			Houston Lab 2	
				MDL	LOD	QL	MDL	QL
xylenes	1330-20-7	580,000 ns					1.0	5.0
Methyl acetate	79-20-9	78,000,000 ns	NS				0.7	5
Methyl t-butyl ether	1634-04-4	47,000 c	47,000	0.409	1	5	0.5	5
Methylcyclohexane	*108-87-2*	*NS*	*NS*				*1.0*	*5*
Methylene Chloride (Dichloromethane)	75-09-2	57,000 c**	57,000	4.22	5	20	1.0	10
o-Xylene	95-47-6	650,000 ns	*NS*	0.985	1	1	1.0	5.0
Styrene	100-42-5	6,000,000 ns	*NS*	0.205	1	5	0.7	5
Tetrachloroethene	127-18-4	24,000 c**	24,000	0.370	1	5	0.7	5
Toluene	108-88-3	4,900,000 ns	*NS*	1.00	1	5	0.6	5
trans-1,2-Dichloroethene	156-60-5	1,600,000 n	*NS*	0.434	1	5	0.5	5
trans-1,3-Dichloropropene (542-75-6)	10061-02-6	1,800 c*	1,800	*0.909*	*1*	*5*	0.6	5
Trichloroethene	79-01-6	940 c**	940	0.494	1	5	0.6	5
Trichlorofluoromethane	75-69-4	23,000,000 ns	*NS*				0.5	5
Vinyl chloride	75-01-4	59 c	59	0.441	1	5	0.8	2

Semivolatile Organic Compounds – Soil

Analyte	CAS Number	Summay RSL (ug/kg) THQ=1	Carcinogenic RSL1 (ug/kg)	Achievable Laboratory Limits[2,3] (ug/kg)				
				Houston Lab 1			Houston Lab 2	
				MDL	LOD	QL	MDL	QL
1,1'-Biphenyl$_5$	92-52-4	47,000 n	87,000	14.7	66.7	167	1.7	6.6
1,2,4,5-Tetrachlorobenzene	95-94-3	23,000 n	*NS*	16.5	66.7	167		
1,4-Dioxane$_5$	123-91-1	5,300 c	5,300					
2,4,5-Trichlorophenol	95-95-4	6,300,000 n	*NS*	19.1	66.7	167	2.5	6.6
2,4,6-Trichlorophenol	88-06-2	49,000 c**	48,000	15.8	66.7	167	1.7	6.6
2,4-Dichlorophenol	120-83-2	190,000 n	*NS*	17.4	66.7	167	1.3	6.6
2,4-Dimethylphenol	105-67-9	1,300,000 n	*NS*	16.5	167	167	3.3	6.6
2,4-Dinitrophenol	51-28-5	130,000 n	*NS*	24.2	66.7	333	4.5	13.2
2,4-Dinitrotoluene	121-14-2	1,700 c*	1,700	12.7	66.7	167	0.9	6.6
2,6-Dinitrotoluene	606-20-2	360 c*	360	23.3	66.7	167	3.3	6.6
2-Chloronaphthalene	91-58-7	4,800,000 n	*NS*	29.0	66.7	167	1.3	6.6
2-Chlorophenol	95-57-8	390,000 n	*NS*	15.8	66.7	167	1.3	6.6
2-Methylnaphthalene	91-57-6	240,000 n	*NS*	45.2	66.7	167	0.5	3.3
2-Methylphenol (o-Cresol)	95-48-7	3,200,000 n	*NS*	18.5	66.7	167	1.1	6.6
2-Nitroaniline	88-74-4	630,000 n	*NS*	15.6	66.7	333	1.9	6.6
2-Nitrophenol	*88-75-5*	*NS*	*NS*	*14.6*	*66.7*	*167*	*2.5*	*6.6*
2,3,4,6-Tetrachlorophenol	58-90-2	1,900,000 n	*NS*	12.3	66.7	167	1	6.6
3,3'-Dichlorobenzidine	91-94-1	1,200 c	1,200	15.4	66.7	333	2.5	6.6
3-Nitroaniline5	*99-09-2*	*NS*	*NS*	13.9	66.7	333	1.9	6.6
3&4-Methylphenol (m/p-cresol)	*15831-10-4*	*NS*	*NS*	15.4	66.7	167		
3 methylphenol (m-cresol)	*108-39-4*	*3,200,000 n*	*NS*					
4 methylphenol (p-cresol)	*106-44-5*	6,300,000 n	*NS*					
4,6-Dinitro-2-methylphenol	534-52-1	5,100 n	*NS*	12.7	66.7	333	2.1	6.6
4-Bromophenyl phenyl ether	*101-55-3*	*NS*	*NS*	*13.3*	*66.7*	*167*	*1.6*	*6.6*
4-Chloro-3-methylphenol	59-50-7	6,300,000 n	*NS*	18.4	66.7	167	0.7	6.6
4-Chloroaniline	106-47-8	2,700 c*	2,700	12.6	66.7	333	1.1	6.6
4-Chlorophenyl phenyl ether	*7005-72-3*	*NS*	*NS*	*16.2*	*66.7*	*167*	*1.5*	*6.6*
4-Nitroaniline	100-01-6	27,000 c**	27,000	13.9	66.7	333	2.2	6.6
4-Nitrophenol	*100-02-7*	*NS*	*NS*	*25.8*	*66.7*	*333*	*1.9*	*13.2*
Acenaphthene	83-32-9	3,600,000 n	*NS*	15.5	66.7	167	0.5	3.3
Acenaphthylene	*208-96-8*	*NS*	*NS*	*14.8*	*66.7*	*167*	*1*	*3.3*
Acetophenone	98-86-2	7,800,000 ns	*NS*	14.3	66.7	167	0.8	6.6
Anthracene	120-12-7	18,000,000 n	*NS*	13.8	66.7	167	0.5	3.3
Atrazine	1912-24-9	2,400 c	2,400	16.5	66.7	333	2	6.6
Benzaldehyde	100-52-7	170,000 c*	170,000	17.0	66.7	333	1.2	6.6
Benzo[a]anthracene	56-55-3	1,100 c	1,100	14.1	66.7	167	1.6	3.3
Benzo[a]pyrene	50-32-8	110 c	110	17.2	66.7	167	1	3.3
Benzo[b]fluoranthene	205-99-2	1,100 c	1,100	12.6	66.7	167	1.2	3.3

Semivolatile Organic Compounds – Soil

Analyte	CAS Number	Summay RSL (ug/kg) THQ=1	Carcinogenic RSL1 (ug/kg)	Achievable Laboratory Limits[2,3] (ug/kg)				
				Houston Lab 1			Houston Lab 2	
				MDL	LOD	QL	MDL	QL
Benzo[g,h,i]perylene	*191-24-2*	*NS*	*NS*	*15.4*	*66.7*	*167*	*0.7*	*3.3*
Benzo[k]fluoranthene	207-08-9	11,000 c	11,000	19.4	66.7	167	0.9	3.3
bis (2-chloroisopropyl) ether	108-60-1	3,100,000 ns	*NS*	17.8	66.7	167	0.9	6.6
Bis(2-chloroethoxy)methane	111-91-1	190,000 n	*NS*	16.8	66.7	167	1.1	6.6
Bis(2-chloroethyl)ether	111-44-4	230 c	230	15.2	66.7	167	1.4	6.6
Bis(2-ethylhexyl) phthalate	117-81-7	39,000 c*	39,000	167.0	167.0	333	1.7	6.6
Butyl benzyl phthalate	85-68-7	290,000 c*	290,000	18.2	66.7	167	1.3	6.6
Caprolactam	105-60-2	31,000,000 n	NS	20.3	66.7	167	1.2	6.6
Carbazole	*86-74-8*	*NS*	*NS*	*16.6*	*66.7*	*167*	*1.2*	*6.6*
Chrysene	218-01-9	110,000 c	110,000	16.5	66.7	167	0.8	3.3
Dibenz(a,h)anthracene	53-70-3	110 c	110	12.7	66.7	167	1.6	3.3
Dibenzofuran	132-64-9	73,000 n	NS	15.4	66.7	167	0.7	3.3
Diethyl phthalate	84-66-2	51,000,000 n	NS	15.3	66.7	167	1	6.6
Dimethyl phthalate	131-11-3	*NS*	*NS*	*15.9*	*66.7*	*167*	*0.8*	*6.6*
Di-n-butyl phthalate	84-74-2	6,300,000 n	NS	16.0	66.7	167	1.2	6.6
Di-n-octyl phthalate	117-84-0	630,000 n	NS	13.3	66.7	167	0.9	6.6
Fluoranthene	206-44-0	2,400,000 n	NS	14.7	66.7	167	1.1	3.3
Fluorene	86-73-7	2,400,000 n	NS	13.8	66.7	167	1.1	3.3
Hexachlorobenzene	118-74-1	210 c	210	16.2	66.7	167	0.9	6.6
Hexachlorobutadiene	87-68-3	1,200 c*	1,200	13.8	66.7	167	1.2	6.6
Hexachlorocyclopentadiene	77-47-4	1,800 n	*NS*	15.2	66.7	167	0.8	6.6
Hexachloroethane	67-72-1	1,800 c*	1,800	17.3	66.7	167	1.5	6.6
Indeno[1,2,3-cd]pyrene	193-39-5	1,100 c	1,100	13.4	66.7	167	0.8	3.3
Isophorone	78-59-1	570,000 c*	570,000	14.5	66.7	167	0.8	6.6
Naphthalene	91-20-3	3,800 c*	3,800	15.6	66.7	167	0.6	3.3
Nitrobenzene	98-95-3	5,100 c*	5,100	18.5	66.7	167	0.9	6.6
N-Nitrosodi-n-propylamine	621-64-7	78 c	78	17.4	66.7	167	1.1	6.6
N-Nitrosodiphenylamine	86-30-6	110,000 c	110,000	18.6	66.7	167	0.7	6.6
Pentachlorophenol	87-86-5	1,000 c	1,000	12.1	66.7	333	3.3	6.6
Phenanthrene	*85-01-8*	*NS*	*NS*	*16.6*	*66.7*	*167*	*1.5*	*3.3*
Phenol	108-95-2	19,000,000 n	*NS*	15.0	66.7	333	1.1	6.6
Pyrene	129-00-0	1,800,000 n	*NS*	14.6	66.7	167	0.6	3.3

Inorganics – Soil

Analyte	CAS Number	Summay RSL (mg/kg) THQ=1	Carcinogenic RSL (mg/kg)	Achievable Laboratory Limits (mg/kg)				
				Houston Lab 1			Houston Lab 2	
				MDL	LOD	QL	MDL	QL
Aluminum	7429-90-5	77,000 n	NS	1.21	2	20		
Antimony	7440-36-0	31 n	NS	0.432	0.5	2	0.065	0.5
Arsenic	7440-38-2	0.680 c*R	0.68	0.424	0.5	2	0.07	0.5
Barium	7440-39-3	15,000 n	NS	0.127	0.25	1	0.03	0.5
Beryllium	7440-41-7	160 n	1,600	0.0706	0.1	0.4	0.021	0.5
Cadmium	7440-43-9	71 n	2,100	0.239	0.25	1	0.027	0.5
Calcium	*7440-70-2*	*NS*	*NS*	*4.95*	*5*	*20*		
Chromium	*7440-47-3*	*NS*	*NS*	*0.0704*	*0.125*	*1*	*0.023*	*0.5*
Cobalt	7440-48-4	23 n	420	0.298	0.5	1		
Copper	7440-50-8	3,100 n	NS	0.443	0.5	2		
Iron	7439-89-6	55,000 n	NS	2.7	5	20		
Lead	7439-92-1	400	NS	0.476	0.5	2	0.013	0.5
Magnesium	*7439-95-4*	*NS*	*NS*	*4.8*	*5*	*40*		
Manganese	*7439-96-5*	*1,800* n	*NS*	0.278	0.5	2		
Mercury	7439-97-6	11 ns	NS	0.0038		0.02	0.47	3.325
Nickel	7440-02-0	1,500 n	15,000	0.248	0.25	1	0.048	0.5
Potassium	*7440-22-4*	*NS*	*NS*	*15.8*	*25*	*50*		
Selenium	7782-49-2	390 n	NS	0.498	0.75	3	0.015	0.5
Silver	7782-49-2	390 n	NS	0.565	1	3	0.015	0.5
Sodium	*7440-23-5*	*NS*	*NS*	*7.22*	*12.5*	*50*		
Thallium	7440-28-0	0.780 n	NS	0.427	1	2		
Vanadium	7440-62-2	390 n	NS	0.553	1	9		
Zinc	7440-66-6	23,000 n	NS	0.556	0.75	3		

Pesticides – Soil

Analyte	CAS Number	Summay RSL (ug/kg) THQ=1		Carcinogenic RSL1 (ug/kg)	Achievable Laboratory Limits[2,3] (ug/kg)				
					Houston Lab 1			Houston Lab 2	
					MDL	LOD	QL	MDL	QL
4,4'-DDD	72-54-8	1,900	c	1,900	0.266	1.7	3.3	0.5	3.3
4,4'-DDE	72-55-9	2,000	c	2,000	0.160	0.8	3.3	0.5	3.3
4,4'-DDT	50-29-3	1,900	c*	1,900	0.386	1.7	3.3	0.5	3.3
Aldrin	309-00-2	39	c*	39	0.166	1.7	3.3	0.3	1.67
alpha-BHC	319-84-6	86	c	85	0.128	1.7	3.3	0.3	1.67
alpha-Chlordane	*5103-71-9*	*NS*		*NS*	*0.184*	*1.7*	*3.3*	0.2	1.67
beta-BHC	319-85-7	300	c	300	0.282	1.7	3.3	0.3	1.67
delta-BHC	*319-86-8*	*NS*		*NS*	*0.216*	*0.8*	*3.3*	*0.2*	*1.67*
Dieldrin	60-57-1	34	c*	34	0.229	1.7	3.3	0.5	3.3
Endosulfan I (115-29-7)	959-98-8	470,000	n	*NS*	*0.165*	*1.7*	*3.3*	0.3	1.67
Endosulfan II (115-29-7)	33213-65-9	470,000	n	*NS*	*0.225*	*1.7*	*3.3*	0.6	3.3
Endosulfan sulfate	*1031-07-8*	*380,000*	n	*NS*	*0.157*	*1.7*	*3.3*	0.6	3.3
Endrin	72-20-8	19,000	n	*NS*	*0.219*	*1.7*	*3.3*	0.6	3.3
Endrin aldehyde	*7421-93-4*	*NS*		*NS*	*0.149*	*1.7*	*3.3*	*0.6*	*3.3*
Endrin ketone	*53494-70-5*	*NS*		*NS*	*0.477*	*1.7*	*3.3*	*0.6*	*3.3*
gamma-BHC (Lindane)	58-89-9	570	c*	570	0.346	1.7	3.3	0.2	1.67
gamma-Chlordane	*5103-74-2*	*NS*		*NS*	*0.158*	*1.7*	*3.3*	*0.2*	*1.67*
Heptachlor	76-44-8	130	c	130	0.156	1.7	3.3	0.3	1.67
Heptachlor epoxide	1024-57-3	70	c*	70	0.198	1.7	3.3	0.3	1.67
Methoxychlor	72-43-5	320,000	n	NS	0.529	1.7	3.3	3.4	16.7
Toxaphene	8001-35-2	490	c	490	11.3	41.7	83.3	4.8	16.7

Polychlorinated Biphenyls – Soil

Analyte	CAS Number	Summay RSL (ug/kg) THQ=1	Carcinogenic RSL1 (ug/kg)	Achievable Laboratory Limits[2,3] (ug/kg)				
				Houston Lab 1			Houston Lab 2	
				MDL	LOD	QL	MDL	QL
PCB-1016	12674-11-2	4,100 n	6,700	7.90	8.33	33.3	4.2	16.7
PCB-1221	11104-28-2	200 c	200	7.90	8.33	33.3	5.6	16.7
PCB-1232	11141-16-5	170 c	170	7.90	8.33	33.3	4.5	16.7
PCB-1242	53469-21-9	230 c	230	7.90	8.33	33.3	5.9	16.7
PCB-1248	12672-29-6	230 c	230	7.90	8.33	33.3	5.9	16.7
PCB-1254	11097-69-1	240 c*	240	5.21	8.33	33.3	4.7	16.7
PCB-1260	11096-82-5	240 c	240	5.21	8.33	33.3	4	16.7

Herbicides – Soil

Analyte	CAS Number	Summay RSL (ug/kg) THQ=1	Carcinogenic RSL (ug/kg)	Achievable Laboratory Limits[2,3] (ug/kg)				
				Houston Lab 1			Houston Lab 2	
				MDL	LOD	QL	MDL	QL
2,4,5-T	93-76-5	630,000 n	NS	1.07	8.33	8.33	1.90	5.00
2,4-D	94-75-7	700,000 n	NS	2.21	8.33	8.33	14.0	33.3
2,4-DB	94-82-6	1,900,000 n	NS	3.25	8.33	8.33	21.0	50.0
Dalapon	75-99-0	1,900,000 n	NS	6.41	8.33	8.33	61.0	133
Dicamba	1918-00-9	1,900,000 n	NS	3.39	3.33	8.33	3.20	6.67
Dichlorprop	*120-36-5*	*NS*	*NS*	*2.94*	*8.33*	*8.33*	*20.0*	*50.0*
MCPA	94-74-6	32,000 n	NS	296	833	833	3600	6670
Picloram	1918-02-1	4,400,000 n	NS					
Silvex (2,4,5-TP)	93-72-1	510,000 n	NS				1.70	3.33
MCPP	93-65-2	63,000 n	NS	210	833	833	2900	6670
Dinoseb	88-85-7	63,000 n	NS	2.55	3.33	8.33	14.0	33.3

Notes:

1)Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, Residential Soil. Carcinogenic Located at http://www.epa.gov/region9/superfund/prg/ In cases where the RSL is below the laboratory QL, all

2)MDLs and QLs are based on laboratory QC limits for analysis of soil samples following SW846 8151. The criteria using the procedures in its laboratory quality assurance manual.

3)MDLs and QLs presented are unadjusted for solid content and dilution factors. Actual MDLs and QLs for samples

4)The accuracy limits represent the minimum acceptance criteria for matrix spike samples and laboratory control it is expected that individual laboratory limits will vary. The control criteria for laboratory control samples are expected

5)NS = Screening level not available

6)NA = Not applicable

orange - Lab MDL or RL is greater than EPA RSL

green - Lab QC

yellow - analyte is typically reported under different method (VOC/ SV

gray - no data (Lab did not provide or does not analyze)

Gray text/ italics - no EPA RSL

APPENDIX F

Chemical Laboratory Quality Manual and SOPs

(These documents will be attached once the Laboratory is Selected)